

HEARING ON ALTERNATIVE AGRICULTURE AND RURAL ECONOMIC DEVELOPMENT

Y 4. SM 1/2: S. HRG. 103-298

Hearing on Alternative Agriculture...

HEARING BEFORE A SUBCOMMITTEE OF THE COMMITTEE ON SMALL BUSINESS UNITED STATES SENATE ONE HUNDRED THIRD CONGRESS FIRST SESSION

SUBCOMMITTEE ON RURAL ECONOMY AND FAMILY FARMING

HEARING ON ALTERNATIVE AGRICULTURE AND RURAL ECONOMIC
DEVELOPMENT

JULY 14, 1993



Printed for the Committee on Small Business

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July 14, 1993:	
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HEARING ON ALTERNATIVE AGRICULTURE AND RURAL ECONOMIC DEVELOPMENT

WEDNESDAY, JULY 14, 1993

U.S. SENATE,
SUBCOMMITTEE ON RURAL ECONOMY
AND FAMILY FARMING,
COMMITTEE ON SMALL BUSINESS,
Washington, DC.

The Subcommittee met, pursuant to notice, at 9:30 a.m., in room 428-A, Russell Senate Office Building, Hon. Paul David Wellstone (Chairman of the Subcommittee) presiding.

OPENING STATEMENT OF HON. PAUL DAVID WELLSTONE, A U.S. SENATOR FROM THE STATE OF MINNESOTA

Senator WELLSTONE. Well, it is 9:30 a.m. and we have a full agenda. So, I think what we will do is start promptly. People are going to be coming in and out. I believe Senator Kohl will be here, as will Senator Pressler. As business of the Senate goes by, people will be coming in and out.

I would like to thank our distinguished witnesses and others for being here. Today's topic must be important since scheduling this hearing we have discovered that two other congressional committees are examining closely related subjects elsewhere on the Hill this morning.

Various congressional committees, as well as major news organizations, have been reacting lately to the release late in June of a report from the National Academy of Sciences. That report, as I think most of you know, criticized the way the Federal Government assesses the health effects of pesticides in food on children and infants.

The NAS pesticide report, like an earlier major NAS report related to agriculture and the environment, which was released back in 1988 and was called *Alternative Agriculture*, has created a significant stir in American agriculture and food policy circles. Just as that earlier report contributed to important policy changes that were authorized in the 1990 farm bill, this report and the justified public reaction to it will undoubtedly become a part of further policy change.

Indeed, at about the same time of the report's release just over 2 weeks ago, three Federal Government agencies were making significant policy announcements. The administration has announced what EPA Administrator Carol Browner called "a dramatic shift in

policy to reduce the use of pesticides and promote sustainable agriculture."

I strongly support such a policy shift. For both health and environmental reasons, we must move quickly and decisively toward more ecologically sound farming practices.

At the same time, I note the reaction of NAS panel chairman Philip Landrigan of New York's Mount Sinai School of Medicine to the administration's policy announcement. According to the Washington Post, Dr. Landrigan praised the announcement, but he also expressed concern that "the remedies proposed by the agencies are vague promises for action in the future," and said that he "didn't see anything that spoke to the here and now."

Well, today's witnesses should be able to speak to the here and now concerning a transition to more environmentally sustainable agriculture. I expect some very concrete suggestions today for Congress and for the administration regarding how to improve or extend our current programs that promote alternative agriculture.

This hearing, however, and this Subcommittee must do more than suggest new directions in farm or regulatory policy. It is not, after all, within the jurisdiction of the Small Business Committee to change farm policy, although we might like to.

This Subcommittee is concerned about the rural economy, and this hearing is the first in a series that will examine the state of rural America and promising strategies for rural economic development. As Federal policy encourages farmers to make a transition to more sustainable practices, we cannot neglect the economic needs of rural communities.

Therefore, our principal question today is a simple one. Is alternative agriculture a promising strategy for rural economic development? In other words, aside from the fact that alternative agriculture is desirable for environmental and health reasons, is it economically viable, and does it contribute to the economic revitalization of rural communities?

Further, if alternative agriculture is a promising strategy for rural economic development, then what impediments exist to its further progress, and what is the proper Federal role in promoting it? We will be particularly interested to hear whether witnesses see any positive role for the Small Business Administration to play in promoting small, alternative agribusiness.

Next Wednesday this Subcommittee will hold another hearing. The title will be "The Federal Role in Economic Development." At that hearing, we will hear testimony from Bob Nash who is USDA's Under Secretary of Small Community and Rural Development, and from Chuck Hertzberg, who is SBA's Assistant Administrator for Finance. I hope to be able to present some ideas from today's hearing to those two gentlemen at that time.

I look forward to today's testimony. Agriculture remains the foundation of this country's rural economy and it is key to our future renewable resource base. Alternative agriculture, by which for the purposes of today's hearing we mean both sustainable agriculture and new uses for agricultural products, presents exciting, new opportunities for sustainable economic development.

Let me just also say that when I talked to Chairman Bumpers about chairing this Subcommittee, I told him that I really consider

it to be an important subcommittee in the United States Senate and that I intend to make this a very active subcommittee. This will not be symbolic politics. This is the first of several hearings, and we intend to translate the testimony into some concrete policy suggestions.

Senator WELLSTONE. Let me, first of all, start out with the first panel. I would like to welcome George Bird who is Director of USDA's Sustainable Agriculture Research and Education Program, and also Paul O'Connell, Director of USDA's Alternative Agriculture Research and Commercialization Program. I think what we will do is start with Mr. Bird and then we will go with Mr. O'Connell. Then we will go with questions. I would like to thank the two of you for being here. I deeply appreciate the work that you do.

[The prepared statement of Senator Wellstone follows:]

PREPARED STATEMENT OF SENATOR WELLSTONE

I'd like to thank our distinguished witnesses and others for being here. Today's topic must be important: since scheduling this hearing we have discovered that two other congressional committees are examining closely related subjects elsewhere on the Hill this morning.

Various congressional committees, as well as major news organizations, have been reacting lately to the release in June of a report from the National Academy of Sciences. That report criticized the way the Federal Government assesses the health effects of pesticides in food on children and infants.

The NAS pesticide report, like an earlier major NAS report related to agriculture and the environment, which was released in 1989 and was called "Alternative Agriculture," has created a significant stir in American agriculture and food policy circles. And just as that earlier report contributed to important policy changes authorized by the 1990 Farm Bill, this report, and the justified public reaction to it, will undoubtedly become a part of further policy change.

Indeed, at about the same time of the report's release, just over 2 weeks ago, three Federal Government agencies were making a significant policy announcement. The Administration has announced what EPA Administrator Carol Browner called "a dramatic shift in policy to reduce the use of pesticides and promote sustainable agriculture."

I strongly support such a policy shift. For both health and environmental reasons, we must move quickly and decisively toward more ecologically sound farming practices.

At the same time, I note the reaction of the NAS panel Chairman, Philip Landrigan of New York's Mount Sinai School of medicine, to the Administration's policy announcement. According to the Washington Post, Dr. Landrigan praised the announcement. But he also expressed concern that "the remedies proposed by the agencies are vague promises for action in the future," and said that he "didn't see anything that spoke to the here and now."

Well, today's witnesses should be able to speak to the here and now concerning a transition to more environmentally sustainable agriculture. I expect some very concrete suggestions today for Congress and for the Administration regarding how to improve or extend our current programs that promote alternative agriculture.

This hearing, however, and this Subcommittee, must do more than suggest new directions in farm or regulatory policy. It is not, after all, within our jurisdiction to change farm policy, although we might like to.

This Subcommittee is concerned about the rural economy. And this hearing is the first in a series that will examine the state of rural America and promising strategies for rural economic development. As federal policy encourages farmers to make a transition to more sustainable practices, we cannot neglect the economic needs of rural communities.

Therefore, our principle question today is a simple one. Is alternative agriculture a promising strategy for rural economic development? In other words, aside from the fact that alternative agriculture is desirable for environmental and health reasons, is it economically viable? And does it contribute to the economic revitalization of rural communities?

Further, if alternative agriculture is a promising strategy for rural economic development, then what impediments exist to its further progress? And what is the

proper Federal Government role in promoting it? We will be particularly interested to hear whether witnesses see any positive role for the Small Business Administration to play in promoting small, alternative agribusiness.

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I look forward to today's testimony. Agriculture remains the foundation of this country's rural economy. And it is key to our future renewable resource base. Alternative agriculture—by which for the purposes of today's hearing we mean both sustainable agriculture and "new uses" for agricultural products—presents exciting new opportunities for sustainable economic development.

Senator WELLSTONE. Mr. Bird.

STATEMENT OF GEORGE W. BIRD, DIRECTOR, SUSTAINABLE AGRICULTURE RESEARCH AND EDUCATION PROGRAM, COOPERATIVE STATE RESEARCH SERVICE, U.S. DEPARTMENT OF AGRICULTURE, WASHINGTON, DC

Mr. BIRD. Senator Wellstone, it is indeed a privilege to be invited today to testify before this Subcommittee. Approximately 22 months and 2 weeks ago, I took a leave of absence from my professorship at Michigan State University to assume the position of Director of USDA's Sustainable Agriculture Research and Education Program. Today my testimony is going to be divided into three parts.

First, I would like to give you a historical overview of the SARE, the Sustainable Agriculture Research and Education program. Second, I would like to talk about its current state, particularly about how it works because I think that may be very important for your Subcommittee's future deliberations, and then third, about how sustainable agriculture in the United States is becoming a catalyst for a broader area of sustainable development.

Now, during the past 50 years, many people have considered U.S. agriculture as the envy of the world. This system, however is based on a single model, and this particular model is the industrial agribusiness model. It has, however, resulted in a number of unexpected consequences, and some of these unexpected consequences have been negative in relation to human health, our environment, and also economic effects. In my testimony today I have listed two publications: one, the testimony of Stewart Smith to the Joint Economic Committee of the House and the Senate last fall, and that has some very important things in it in relation to these unexpected consequences, and also my own testimony to the Senate in relation to integrated pest management for the planning of the 1990 farm bill.

In response to these unexpected consequences, in 1988 the U.S. Congress appropriated \$3.9 million for an alternative agriculture program in research and education. This program became known as the Low Input Sustainable Agriculture Program, or LISA. The name of the program was changed to SARE with the 1990 farm bill. Today in fiscal year 1993, SARE is funded at \$6.725 million. The resources are targeted to chapter 1 of subtitle B of title XVI of the farm bill.

Approximately 2 years ago, Congressman Mike Synar of Oklahoma and Congressman Fred Grandy of Iowa mandated a GAO audit of the SARE program. The results of this audit were released on September 17, 1992, in a Senate hearing. I believe that this particular document, which contains a description of SARE in relation to the overall programs and organization of USDA, is a very important document for your Committee to have at its disposal.

While SARE is managed by the Cooperative State Research Service in cooperation with the Extension and the Agricultural Research Service, more important is the fact that it has a statutory mandate to be run by Regional Administrative Councils, and I want to stress the word "administrative," because this particular model may be helpful to you in your future deliberations of the Subcommittee.

Council membership consists of farmers and ranchers, members of nonprofit, private organizations, agribusiness, government, and academia. Congress instructed USDA to develop new coalitions among these groups of individuals, and it is this particular mandate that forms the grassroots foundation of the SARE program.

The Councils are full partners with Government in relation to recommending policy, determining how the money that is appropriated is spent, and also the development of oversight protocols. This unique way of doing business transfers the responsibility and empowers citizens at the regional and local levels in relation to the SARE program.

Each one of these grassroots Councils then appoints a host institution to manage the program, and our current host institutions are located at the University of Vermont, the University of Nebraska, the University of California, and a coalition between the University of Georgia and Fort Valley State College.

SARE is designed to provide a research and education base for the sustainability of U.S. agriculture. SARE, however, is different than most of the programs because it emphasizes whole farm systems and on-farm research with special emphasis to shared decisionmaking and meaningful involvements of the farmers and ranchers in these research projects. Many of these occur on farms and the farmers are major participants or actually they design the research in many cases with the help other full-time researchers.

The program also has a major commitment to farmer-to-farmer education. This is another unique attribute of the program.

Two years ago when I assumed the directorship of the program, I knew I was going to be dealing with a unique program, and one that emphasized environmentally sound farming practices. What came as a surprise to me, however, is the amount of emphasis during the past 2 years that has been put on quality of life issues, quality of life issues for farmers and ranchers, the farm and ranch families, members of rural communities, and society as a whole. SARE has a National Task Force on Quality of Life, and it has recently finished its first product and is beginning to start some educational programs throughout the country.

The SARE program also has a major economic impact assessment initiative in relation to alternative agriculture. At the moment we have six regional, micro-economic projects scattered throughout the country and one macro-level economic impact as-

assessment project. These activities are directly related to the rural economy and family farming.

Something else that is different about the SARE program is the way projects are evaluated. The SARE Regional Administrative Councils put out calls for proposals and these calls for proposals are based on the specific needs of the regions as perceived by these grassroots councils. The proposals that are submitted are evaluated in respect to relevancy for sustainable agriculture by these regional administrative councils or a special task force. Then acceptable proposals are sent to technical committees where they are evaluated for scientific merit. This again is done by a technical committee of scientists but farmers and ranchers and nonprofit, private members are also on these committees. This is a unique review protocol. It is a very important attribute of the SARE program. It provides a balanced integration of both the sustainable agricultural priorities of the regions and also the expertise of the scientific community.

In addition to the SARE resources, the program works very closely with the Environmental Protection Agency, and EPA provides \$1 million annually for a program that is known as ACE, or Agriculture in Concert with the Environment. The SARE program is also currently searching for other ways to work with the integrated pest management and water quality initiatives. I am pleased to inform you this morning that on June 9 to 11, the first meeting of the National Sustainable Agriculture Advisory Council was held in Omaha, NE. This is a council that is mandated statutorily by the 1990 Farm Bill.

Although the SARE program focuses exclusively on sustainable agriculture, it is by no means the only activities in this area addressed by the United States Department of Agriculture. Earlier this year that Agricultural Research Service, using basically the definition of sustainable agriculture in the Farm Bill, found that about 25 percent of their current research projects could be classified as contributing to sustainable agriculture. There are other activities in our State agriculture experiment stations, cooperative extension services, and schools of forestry throughout the country. In 1992, the USDA's Small Business Innovative Research Program funded seven projects in the category of rural and community development.

Sustainable agriculture research and education activities are having important impacts on our U.S. agricultural community and also on our scientific community. Some of the results of these initiatives include building soil fertility, reducing water pollution, controlling weeds with fewer herbicides, improving dryland farming systems, boosting livestock profits, using legumes to replace fallow, and probably of most importance to your Committee is improving the quality of life for U.S. farm families. Some of the testimonials that we receive on some of these farms are very, very moving. I wish I had the time this morning to relate some of these specific examples to you.

The procedures associated with sustainable agriculture are designed to enhance America's economic strength and create meaningful employment opportunities at both the farm and local community levels. In many cases local value-added technologies are an essential component of sustainable agriculture, and of course this

is directly related to the rural community and, where needed, rural revitalization.

The definition of sustainable agriculture in the 1990 farm bill has been very important during the past 2 years. A widespread part of the U.S. agricultural community recognizes this definition as a goal for U.S. agriculture. It is also very compatible with President Clinton's April 21, 1993, Earth Day commitment to biological diversity. The emerging concept of sustainable agriculture, however, will require alternative agricultural systems that are fundamentally and structurally different from the industrial agribusiness farm model. Examples of these may include a 21st century diversified family farm model, a part-time farm model, and organic agriculture farm models.

In a keynote address to the Commission on Sustainable Development of the United Nations on June 14, 1993, Vice President Gore announced the establishment of the President's Council on Sustainable Development. Yesterday I learned that the first meeting of this council will be in Washington next Tuesday, July 20, 1993. Sustainable agriculture is serving as a catalyst for the development of a sound overall philosophy of sustainable development. Such a concept will most likely include components related to renewable resources, nonrenewable resources, or wastes or system residuals, social mandates related to the family farm and rural development, and also intergenerational equity. It must be structured in a way that will build strong linkages between our rural communities and also our urban and suburban sectors.

As I prepare to return in a few weeks to Michigan State University, I look forward to transforming many of the concepts that I have tried to relate to you this morning into practical realities. At my land grant institution, my academic instruction, research and extension responsibilities, and my personal life should provide an appropriate forum for these activities. The proposed future deliberations of your Committee in the following hearings are imperative for a sound rural economy that is closely integrated with U.S. agriculture and a 21st century family farm concept.

I thank you for the opportunity to interact with you this morning on this important topic, and I would be pleased to respond to any questions that you or other Members of your Subcommittee wish to direct toward me. Thank you.

[The prepared statement of Mr. Bird follows:]

PREPARED STATEMENT OF GEORGE W. BIRD

Senator Wellstone, and Members of the Subcommittee. It is an honor to provide you with testimony about sustainable agriculture. Twenty-two months and 2 weeks ago, I began a leave of absence from my position as Professor of Nematology at Michigan State University to assume a 2-year appointment as Director of the Sustainable Agriculture Research and Education Program (SARE) for the Cooperative State Research Service, an agency within the U.S. Department of Agriculture (CSRS/USDA). The objective of my testimony is to provide a historical overview of SARE, describe the current state of the program, and present insights on SARE as a catalyst for the evolution of a future concept of sustainable development.

During the past 50 years, U.S. agriculture has been the envy of the world. This system is based on the industrial agribusiness model. It has, however, resulted in a number of unexpected consequences sometimes including negative health or envi-

ronmental effects.* In response, Congress appropriated \$3.9 million in FY 1988 for a new research and education initiative in alternative agricultural systems. The program became known as the Low Input Sustainable Agriculture Program, or LISA. It was renamed Sustainable Agriculture Research and Education (SARE) in the Food, Agriculture, Conservation and Trade (FACT) Act of 1990. In FY 1993, SARE is funded at \$6.725 million. These resources are targeted to Chapter 1 of Subtitle B of Title XVI of the FACT Act of 1990. In response to a joint request from Congressman Mike Synar of Oklahoma and Congressman Fred Grandy of Iowa, the General Accounting Office (GAO) released a report entitled, "Sustainable Agriculture: Program Management, Accomplishments and Opportunities" on September 17, 1992. The GAO report provides a description of SARE in relation to the overall programs and organization of USDA.

SARE is managed by the Cooperative State Research Service, in cooperation with the Extension Service and close interaction with the Agricultural Research Service. The program is implemented through four statutorily mandated Regional Administrative Councils. Council membership consists of farmers and ranchers, and representatives of non-profit private organizations, agribusiness, government and academia. The Congressional instruction to build new coalitions among these groups of constituents is the grassroots foundation of SARE. As full partners with government, the Regional Councils are responsible for forming recommendations in relation to policy, spending of federal resources and designing oversight protocols. This unique way of doing business transfers responsibility and empowers citizens at the regional and local levels. Each Council appoints a Host Institution for daily management of the regional programs. Current Host Institutions include the University of Vermont, University of Nebraska, University of California, and a new Host Consortium between the University of Georgia and Fort Valley State College.

SARE is designed to provide a research and education base for the sustainability of U.S. agriculture as described in Section 1603 of the FACT Act of 1990. Emphasis is given to whole-farm systems and on-farm research, with special reference to shared decisionmaking and meaningful involvement of farms and ranchers in the design and implementation of SARE projects. The program also has a major commitment to farmer-to-farmer education.

When I assumed the position of Director, I knew that I would be involved with an innovative program dealing with research and education related to environmentally sound farming practices. To my surprise, however, many of the activities during the past 2 years have been in the area of "quality of life": quality of life for farmers and ranchers, members of rural communities and society as a whole. SARE has a National Task Force on Quality of Life, and an Economic Impact Assessment Initiative in cooperation with the Economic Research Service. These activities are directly related to rural economy and family farming.

SARE Regional Administrative Councils prepare annual requests for research and education proposals. The requests are based on specific needs of the regions in relation to the mandates of the FACT Act of 1990. Proposals or preproposals, depending on the region, are screened for relevancy to sustainable agriculture. This is done by the Regional Administrative Council or a special task force. Each full proposal is then evaluated in a comprehensive manner for scientific merit. This is done by a Technical Committee. Proposals of high technical merit are returned to the Council for development of an appropriate portfolio of projects for funding. This unique review protocol is a very important attribute of SARE. It provides a balanced integration of both the sustainable agriculture priorities of the region, and the expertise of the scientific community.

In addition to Chapter 1 resources, the U.S. Environmental Protection Agency provides \$1.0 million per year for a joint initiative with SARE known as ACE (Agriculture in Concert with the Environment). SARE is also currently investigating ways to increase interactions with existing integrated pest management (IPM) and water quality initiatives. The National Sustainable Agriculture Advisory Council (NSAAC) held its first meeting on June 9-11, 1993. NSAAC is mandated by Section 1622 (FACT Act of 1990) and USDA Regulation 1043-34.

Although the SARE program focuses exclusively on sustainable agriculture research and education, it is by no means the only USDA program addressing sustainability. Using the definition of sustainable agriculture from Section 1603 of the 1990

* Stewart Smith, 1992, Farming Activities and Family Farms: Getting the Concepts Right, October 21, 1992 Testimony to the Joint Economic Committee of the U.S. Congress.

G.W. Bird, 1989, The Integrated Pest Management Experience, (In) Reform and Innovation of Science and Education: Planning for the 1990 Farm Bill, Committee on Agriculture, Nutrition and Forestry, U.S. Senate (pp. 31-41).

Farm Bill, the Agricultural Research Service recently completed an assessment of its research portfolio which showed that approximately 25 percent of its research could be classified as contributing to sustainable agriculture. Additionally, programs in the State Agricultural Experiment Stations, Cooperative Extension Service and the Forestry Schools join the USDA's Cooperative State Research Service, Extension Service and Forest Service with efforts applicable to sustainable agriculture.

Sustainable agriculture research and education activities are having important impacts on both the U.S. agricultural and scientific communities. The results of these initiatives include:

- Building soil fertility,
- Reducing water pollution,
- Controlling weeds with fewer herbicides,
- Improving dryland farming systems,
- Boosting livestock profits,
- Using legumes to replace fallow, and
- Improving the quality of life for U.S. farm families.

The procedures associated with sustainable agriculture are designed to enhance America's economic strength, and create meaningful employment opportunities at both the farm and local community levels. In many cases, local value-added technologies are an essential attribute of sustainable agriculture.

The definition of sustainable agriculture in Section 1603 (FACT Act of 1990) has been very useful. It has become widely accepted by the agricultural community as a goal for U.S. food production systems. It is also very compatible with President Clinton's April 21, 1993, Earth Day commitment to biological diversity. The emerging concept of sustainable agriculture, however, will require alternative agricultural systems that are structurally different from the industrial agribusiness farm model. Examples may include a 21st Century diversified family farm model, a part-time farm model and an organic agriculture farm model.

In a keynote address to The Commission on Sustainable Development of the United Nations on June 14, 1993, Vice-President Gore announced the establishment of the President's Council on Sustainable Development. Sustainable agriculture is serving as a catalyst for the development of a sound overall philosophy of sustainable development. Such a concept will most likely include components related to renewable resources, non-renewable resources, system residuals, social mandates and even intergenerational equity. It must also be structured in a way that will build strong linkages between our rural and urban-suburban sectors.

As I prepare to return to Michigan State University, I look forward to working towards transforming many of the ideals mentioned above into practical realities. My Land Grant Institution academic instruction, research and extension responsibilities, and personal life should provide an appropriate forum. The proposed future deliberations for your Subcommittee, however, are imperative for a sound rural economy that is closely interfaced with U.S. agriculture and the 21st Century Family Farm. Thank you for the opportunity to interact with you on this important topic. I would be pleased to respond to any questions which the Subcommittee may wish to direct toward me.

SARE

1993
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NATIONAL
•
OVERVIEW

Sustainable Agriculture
Research and Education Program



Grants For Farmers Only

A new mini-grant program in the North Central region awarded a total of \$85,349 to 26 farmers to test innovations and share what they learn. "We now have 26 farmers who are project leaders—not just participants. This is clearly a producer-driven program," says Dr. Steve Waller, SARE coordinator for the region. Farmers provided more than \$250,000 in matching funds.

The 109 proposals received provide a reality check for other SARE projects, adds Waller. "We heard directly from farmers what questions they have. Their proposals will help set the agenda for future research."

Nearly half of the funded projects will provide answers about **rotational grazing**. Farmers are testing forages and seedling methods and evaluating confinement vs. forage-based systems for dairy herds. Other livestock projects are looking at the best ration for organic beef and testing fly traps.

Nutrient management and weed control proved nearly as popular. Farmers are measuring nitrogen from cover crops, comparing soil building legumes, and testing different methods of liquid manure application. Others are evaluating the use of no-till and reduced tillage soybeans, comparing ridge till with and without herbicide, and testing weed biocontrol in other projects.

- A Minnesota grower is adapting ridge till to plant sugar beets into cover crops.
- A Kansas cattleman is constructing a heated sprayer to apply molasses feed bait to round bales to protect the hay.
- An Indiana grower is testing seed or modifications to plant vegetables into hairy vetch.
- A North Dakota farmer is developing equipment to plant sunflowers into small grain residue.

All SARE regions will have similar farmer-initiated projects this year.

Is SARE Giving Us Our Money's Worth?

In a word, Yes. And that's from an impartial government agency with a penchant for exposing boondoggle programs.

The U.S. General Accounting Office (GAO), which measures how much bang America gets for its tax buck, conducted an audit of the SARE program in late '91 and early '92 at the request of Reps. Mike Synar (D-Okla.) and Fred Grandy (R-Iowa). "The report came out in September '92, and we were delighted with it," says Dr. Patrick Madden, SARE associate director. "GAO clearly recognizes the great progress we've made despite many obstacles. And they offered many good suggestions for improvement—all of which we're already implementing." Here's a summary of GAO's findings and recommendations.

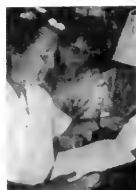
SARE's Accomplishments

- Leverages funds by attracting matching dollars from state governments and private organizations.
- Forges links between farmers, nonprofit groups, agribusiness and public and private research institutions.
- Emphasizes farmer involvement, thereby helping more farmers implement or test sustainable agriculture innovations.
- Makes researchers more receptive to farmers' ideas, concerns and expertise.
- Unique in funding interdisciplinary and systems-oriented research.
- Causes institutional changes at universities to better accommodate sustainable agriculture.

Ways To Improve SARE ...

- Disseminate project results regionally and nationally, instead of just locally, as is often the case now.
- Establish a departmental policy for sustainable agriculture at USDA, to ensure that SARE's goals and activities are coordinated with those of other agencies involved in sustainable agriculture.
- Mobilize the two SARE-governing bodies mandated by the 1990 Farm Bill: the National Sustainable Agriculture Advisory Council (NSAAC) and the Agricultural Council on Environmental Quality (ACEQ).
- Establish a consistent reporting system through the regions and national office, to allow for more accurate and timely accounting and monitoring of program activities.
- Ensure that more SARE projects involve systems-oriented research.

SARE 1993 NATIONAL OVERVIEW



ENHANCED BIOLOGY MAKES UP FOR CHEMICALS

A study of 20 **California** farms found that enhanced biological processes on organic farms compensated for the absence of synthetic fertilizers and pesticides. Researchers found that **tomatoes** grown on organic farms suffered less root disease compared with those grown conventionally, suggesting that organically managed soils suppressed pathogens. Organic farms also had higher and more diverse populations of beneficial insects, and similar yields and insect damage. (West Region project LW88-3.)

COVERS CUT PESTICIDES

Pecan growers could reduce insecticide sprays by two-thirds and eliminate nitrogen fertilizer applications if they plant a mix of crimson clover and hairy vetch under their trees. Studies in **Georgia** and **Oklahoma** show that pea aphids infect these two legumes, attracting



SARE AROUND

CUT COW-CALF COSTS

A **Missouri** study is helping **beef** producers manage pastures to reduce purchased feed, fertilizer and winter bay needs while increasing profits and protecting the environment. Researchers are testing different stock densities and rest periods in

pastures that are subdivided into 3, 12 or 24 paddocks, and are comparing systems that provide water in each paddock with centrally located waterers. They'll monitor cow-calf and stocker performance, pasture productivity and persistence, nutrient cycling and

the economics of each system. (North Central Region project LNC91-38.)



COVERS FOR COTTON

Many **cotton** growers fear cover crops encourage pests. But early findings from seven sites across the **South** showed that fall-planted hairy vetch generally did not increase populations of insects, weeds, soilborne pathogens or nematodes compared with winter fallow. In fact, vetch **reduced** black root rot in cotton. Only root-knot nematodes increased where vetch was used. Researchers point out that long-range studies show covers increase lint production. (South Region project LS 91-40.)

CATTLE BOOST HOG PROFITS

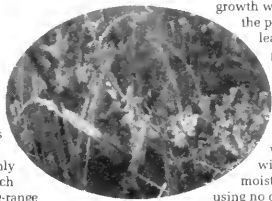
Adding a pasture-based **stocker cattle** enterprise can increase profits for **swine** producers and help them protect the environment. A **North Carolina** study found that intensively grazed Bermudagrass pastures fertilized with liquid hog manure can produce 1,000 to 2,000 pounds of beef per acre — and net about \$300 per acre. Additional site monitoring will help researchers better understand the fate of nitrates in surface- and groundwater. They suggest that planting rye in pastures over winter could increase the system's productivity and uptake of residual soil nitrogen. (South Region project LS 90-26.)

RYE AND VETCH: A GREAT PAIR

When it comes to preventing groundwater pollution and cutting fertilizer costs, a cover-crop mix of rye and hairy vetch gives **corn** growers the best of both worlds. A **Maryland** study shows that if excess nitrogen is left in the soil after corn harvest, rye growth will dominate and reduce the potential for nitrate

leaching. If leftover nitrogen is low, vetch dominates and fixes additional N that can be used by the next corn crop. Researchers also found that planting vetch alone or in a mix with rye conserves soil moisture compared with using no cover crop or rye alone.

A pure vetch cover can eliminate the need for N fertilizer, they add. (Northeast Region project LNE89-13.)





lady beetles, lacewings and other aphid predators. These beneficial insects later migrate into the pecan canopy to devour yellow and black-margined aphids. Researchers estimate that the legumes produce 130 to 160 pounds of slow-release nitrogen per acre, saving growers \$28 per acre. (South Region project LS91-36.)

LEGUMES REPLACE FALLOW

A Montana study is identifying the best legume green manures and practices to replace summer fallow in cereal grain systems. Researchers have screened more than 40 legumes to find which are best-adapted to local conditions and use water most efficiently. Instead of leaving the ground bare, farmers plant the legumes and allow them to grow until they've used up their share of soil moisture. If water is adequate, farmers can harvest forage, or seed crops in the case of peas and lentils. Researchers say this system can reduce erosion, pests and saline seep. (West Region project LW89-14.)



THE COUNTRY

NO-CHEMICAL DAIRIES MAKE MORE MONEY

Most Wisconsin dairy farmers fear they'll sacrifice profits if they cut chemicals. But a myth-busting study by the Wisconsin Rural Development Center shows that's not necessarily true. Economic analyses of 30 farms revealed that no-chemical farmers had a net return on their crops that was 56 percent more per acre than their conventional counterparts. Researchers attribute the advantage to quicker rotations, lower input and capital costs and greater reliance on pastures and small grains. The no-chemical group also made \$1.92 more profit per hundredweight of milk. The project also featured information-sharing sessions for all the farmers. Researchers say that may be one reason why, during the course of the three-year study, the conventional farmers cut their chemical and fertilizer costs by as much as one-third, even though prices for those inputs rose. (North Central Region project LNC88-12.)

Contact regional SARE offices for more information on these and other projects.

HELPING HAND FOR BIOCONTROL

Michigan scientists are investigating the importance of the size and shape of fields and nearby border habitat for biological control of insects and weeds. For example, researchers using the emerging discipline of landscape ecology observed that wildlife removed half of all surface weed seeds within 5 meters of a hedgerow. They also found that the wasp *Enoborus terebrans*, an important parasite of European corn borers, was two to three times more effective in close proximity to wooded borders than in the center of fields or near herbaceous borders. Researchers suspect that wooded borders provide more nectar and other food for adult wasps, as well as a more favorable microclimate. (North Central Region project LNC91-39.)

THESE SARE PROJECTS SPAN REGIONAL BOUNDARIES

Farming for better living. Sustainable agriculture is more than bushels, dollars, and biological options. It's also about better quality of life. A national research team is studying how well individual SARE projects achieve this goal. 1992 SARE funding: \$50,000. *Contact:* Dr. John Ikerd, Center for Sustainable Agriculture, 200 Mumford Hall, University of Missouri, Columbia MO 65211.

Suppose all farmers adopted sustainable methods? What would happen to our economy and environment? USDA's Economic Research Service is tackling that question by analyzing results of farm and ranch studies across the country. 1992 SARE funding: \$1.2 million total for three years, shared by six universities. *Contact:* Greg Grogowski and Linda Calvin, USDA-ERS, 1310 New York Ave., Room 1301, Washington DC 20005-4708.

SARE's very own communications staff. That's the purpose of the Sustainable Agriculture Network. Formed in 1990, SAN supports a variety of efforts designed to promote effective, decentralized communication about sustainable agriculture. 1992 SARE funding: \$115,000. *Contact:* Gabriel Hogen, Room 304, National Agricultural Library, 10301 Baltimore Blvd., Beltsville MD 20705-2151.

They specialize in alternatives. Housed at the National Agricultural Library, the Alternative Farming Systems Information Center uses database searches and other means to help you learn about most any sustainable ag topic — from crop rotations and legumes to reduced tillage and biological pest control. 1992 SARE funding: \$110,000. *Contact:* Jane Gates, Coordinator, AFISC, National Agricultural Library, Room 304, 10301 Baltimore Blvd., Beltsville MD 20705-2151.

Produced With SARE Funding...

Annual SARE and ACE reports, as well as other project summaries, are available free from the national SARE office or from regional SARE coordinators. Here are some other items you might be interested in:

Many of these are available on diskette in Folio InfoBase through the Sustainable Agriculture Network or through Dr. V. Philip Rasmussen Jr., Ag Systems & Technology Dept., UMC 2300, Utah State Univ., Logan, UT 84322-2300.

➤ *Agriculture in Concert with the Environment*

Introductory brochure, 1993. Free. Harry Wells, Pollution Prevention Program, U.S. EPA, 401 M St. SW, MC7409, Washington, DC 20460.

➤ *The Sustainable Agriculture Network*

Introductory brochure, 1993. Free. Gabriel Hegyes, Room 304, National Agricultural Library, 10301 Baltimore Blvd., Beltsville, MD 20705-2351.

➤ *Management Guide for Low-Input*

Sustainable Apple Production. Northeast SARE

Apple Production Project, 1991. \$10. Lorraine P. Berkett, Dept. of Plant and Soil Science, Hills Bldg., Univ. of Vermont, Burlington, VT 05405. Also, Cornell Univ., Rutgers Univ., Rodale Institute Research Center, Univ. of Massachusetts.

➤ *Strategies for Sustainable Agriculture* (six-part, farmer-to-farmer video series: Field Crops, Rotational Grazing, Vegetables, IPM for Vegetables and Small Fruits, IPM for Apples, High-Value Marketing), 1992. \$29.95 each, \$149.95 set. Rooy Media, Frederick, MD; Rodale Institute, Emmaus, PA.

The following three items are available from: Sustainable Agriculture Publications, Dept. of Plant and Soil Science, Hills

Bldg., Univ. of Vermont, Burlington, VT 05405.

➤ *Managing Cover Crops Profitably*, Sustainable Agriculture Handbook Series No. 1, 1992. \$9.95 Sustainable Agriculture Network

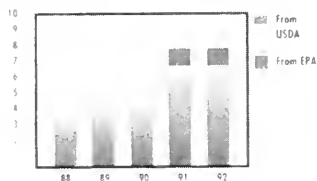
➤ *Sustainable Agriculture Directory of Expertise — 1993*, \$14.95. Sustainable Agriculture Network.

➤ *Showcase of Sustainable Agriculture Information & Educational Materials*, 1991. Sustainable Agriculture Network. \$4.95.



SARE FUNDING

(In Millions)



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Senator WELLSTONE. Thank you, Mr. Bird. One of the central questions that I raised earlier was whether sustainable agriculture would be a promising strategy for rural economic development. I want to champion rural economic development. If I have a dream that I want to make come true, it is to champion rural economic development here in the Senate, and I think your comments were very helpful in beginning to answer that question. I very much appreciate the work you have done and hope we will be able to continue to work together.

Mr. O'Connell.

STATEMENT OF PAUL F. O'CONNELL, DIRECTOR, ALTERNATIVE AGRICULTURAL RESEARCH AND COMMERCIALIZATION CENTER, U.S. DEPARTMENT OF AGRICULTURE, WASHINGTON, DC

Mr. O'CONNELL. Thank you, Senator Wellstone. I am very pleased to be here and talk about new uses and the opportunities in that area. I value the opportunity to discuss the activity underway in USDA's Alternative Agriculture Research and Commercialization Center. I envision considerable potential to expand the commercial use of agriculture materials into industrial products. The result will be that farmers and other small businesses will generate jobs and economic activity. Much of the agriculture and forestry materials will be processed in rural areas because of the bulky nature of the agriculture materials to be processed, hence providing sustainable rural development based on natural and renewable resources of rural communities. I will demonstrate later in my testimony where in our initial projects we see that already happening, and I feel we can move in that direction in a very strong way.

Over the past 5 years, I have helped establish and administer programs such as the Sustainable Agriculture Research and Education Program that George just spoke of. I am very pleased with the leadership that George Bird has given this program the last few years.

I have seen the tremendous progress that can be made working cooperatively with private entrepreneurs. My experience strongly suggests that small business and individual entrepreneurs are the key innovators in our economy. However, they often need financial support and managerial assistance.

A little background on new uses I think is important. I will not cover all of this, but will cover some highlights.

One hundred and fifty years ago, most of our non-food consumer products and industrial raw materials were derived from plant matter in all its forms, fruits, vegetables, grains, grasses, bushes, and trees. The rest came from animal matter and from inorganic materials like sand, iron, and other metal ores. In the mid-19th century, hydrocarbons began to vie for industrial supremacy with carbohydrates from farm and forest materials. Coal and later to a greater extent petroleum became the basic raw material of industry.

Fossil fuels replaced renewable materials because they offered definite advantages. I will skip over a little here.

Now, just 20 years after the age of oil reached its peak, we are seeing the pendulum swing back in favor of an economy based on farm and forest materials. In the 1980s and 1990s, we discovered the disadvantages of relying primarily on fossil fuels. From an environmental perspective, all kinds of pollution from acid rain to global warming, from smog to groundwater pollution, have been linked to using fossil fuels. From a political perspective, relying on distant lands for our energy needs imposes very high national security costs. From an economic perspective, relying on imported raw materials when local alternatives are available at competitive prices weakens local and regional economies.

In the 1990s we may be witnessing a historic turnaround in the fortunes of renewable materials. The comparative economics of carbohydrates and hydrocarbons are changing. Advances in the materials and biological sciences are reducing the cost of manufacturing renewable materials while environmental regulations are increasing the cost of hydrocarbon, i.e. fossil fuel materials. The growing environmental consciousness has provided many customers the willingness to pay a green premium for carbohydrate-derived, environmentally benign products.

One of the questions that we get asked in setting up the AARC center is, "why private/public partnerships". There are some very important reasons why. The challenge today is not a shortage of promising ways to convert renewable materials into useful products. We always need to continue to work on the research, but the real problem is not bringing them far enough along to attract private investment. According to Peter Cannon, chief executive officer of a Silicon Valley start-up company, and also Department of Commerce studies, "For every dollar spent in a lab on research for a project, \$10 dollars is required to develop the research, and \$100 dollars is required to bring production on line." I think this is an area we just simply do not focus on enough.

Examples of these activities are such as identifying market needs, designing equipment, testing products for performance and consumer acceptance. In today's very sophisticated economy, you cannot just put a product out on the market. It has to be tested. The people who buy it want to know how it is going to perform. People want to know how it is going to affect their wellbeing. Regulatory clearance, and this is not just Federal. It is also city, county and State. Converting prototype equipment to a commercial scale. Verifying that the technology performs on a commercial scale, and developing cost, price, and other economic data for financial institutions. These are expensive activities and that is the area that we are involved with in the AARC center. The AARC center assists the private sector in closing the gap between research results and getting a product on the market.

The rate of investment in these developmental activities for new industrial uses for agriculture materials in the U.S. is lower than in Japan and the European Community, in part because the governments in these countries make more support available for commercialization. Private firms alone will not wait the 5 to 10 years that is generally required to obtain adequate returns with promising technologies. Typically their time limit is 2 years or less.

In addition, many of these uses have social benefits, where you cannot expect the private sector to cover the total cost. For example, substituting degradable for nondegradable materials. One-time use plastic containers for food packaging materials and utensils could be made out of starch and other renewable materials, and then we can put them in a compost pile rather than putting them in landfills. Reduced air pollution, particularly in our congested cities. Value-added products processed in rural America creating jobs and economic activity. Encouraging farmers to grow crops and animals for changing industrial markets, therefore, reducing dependence on current farm programs.

Now, I just want to talk briefly about some current activities we have going on to address these issues.

After a lengthy process of proposal announcements, submissions, external and internal reviews, board analysis, and site visits, we are in the final stages of negotiation to fund 26 projects with the available \$10 million that we have.

Just to comment on George's comment, in the future we plan to do these through regional centers. Initially we had to do it through a national network and then we had reviews all across the country. We already set up two regional centers just in the process. One is up in the north central, which includes your State of Minnesota, and one in the south central area.

Also, attached to this testimony is a list of the projects that we are funding. That is in here, a very short version of what each of them are and what we have committed to and what some of the impacts of these are.

Agreements have been completed on 8 of the applicants, 12 more are in final stages of negotiation, and the remaining 6 will be completed within a month. The enabling legislation provides significant flexibility to the board in the type of arrangements. This is a very important concept, in other words, cooperative agreements, repayable grants, contracts, loans, interest subsidies, and venture capital. This flexibility is required to fit the needs of widely varying conditions of organizations with ideas for using agriculture materials in industrial products.

These successful applicants were selected from 407 proposals. In other words, we got 407 proposals requesting \$175 million in support. External reviewers indicated that over half of these had merit. However, due to limited funds, we could only fund 6 percent of these projects.

Funding by the AARC center is usually matched at a minimum on a one-to-one basis by the recipients. The current estimate for the 26 projects is that on average the recipients are investing about \$2.67 for every \$1 invested by the AARC center. The intent is for the private partner to decide which new use will survive in the competitive business world, and that can best be determined by requiring successful applicants to provide a major share of start-up costs. When successful, the applicants are required to reimburse the AARC center's revolving fund that was established in the authorizing legislation not only for the funds provided, but also an amount as recognition for the investment risk. But they only return that when they are successful, and we agree on that ahead

of time. When they attain a certain percent sales level, then we indicate that we want them to start paying the money back.

The 26 projects range from small start-up operations to large impact technologies. Included are 17 small firms, 1 agriculture co-op, 2 nonprofits, 3 medium size, and 3 larger firms. The matching funds range in size from \$10,000 to \$1 million.

These projects involve the use of 17 different plant and animal materials—animal fat, kenaf, waste paper, corn starch, soy meal, soy oil, crambe, industrial rapeseed, canola oil, wheat, lesquerella, hesperaloe, cotton, milkweed, grass straw, perennial grasses, and so forth. The reason it is important to go through that, list in that one of the most important aspects for sustainable agriculture to be successful is to have markets for the vast array of products that would come out of a multi-diversified farm.

Let me just indicate a few of them I have here. Here is one. This is called a "NewStone". It is from Mankato, MN. This is made from soy meal and waste paper. What we are helping them with is in getting the initial production line in place. They are going to do this in St. Peter, Minnesota. Some are providing \$1 million. Once we put the \$1 million up, then they were able to leverage another \$1.5 million to get this point underway. This is just one of them.

Here is a fully degradable garbage bag. This is a "Novon" product. You can put grass and other plant materials in this bag and it will totally compost. It is not partially degradable, it is 100 percent degradable.

This grass seed mat is made out of kenaf and wood fibers. It is made out of totally renewable materials. Rather than just throwing the grass seed out with your hands and so forth, you can do it this way and the grass will stay there in one place until it gets established.

One of the more exciting projects is a product being produced by a small company out in Washington State. I have demonstrated this before and it is rather interesting. This is for cutting oil. Who says that oil and water does not mix? You can put this in water like this, and you stir this up a little bit like this and it totally emulsifies. I am not going to drink it. I am going to drink the water from this glass.

[Laughter.]

Mr. O'CONNELL. You can see how quickly it disburses. Now, the importance of that is when you are talking about oil in a marine environment or in a forest environment or any kind of places where the oil is likely to spill, it will disburse into the water and the fungi and the bacteria and the things that break this down can break this down much more quickly than they can fossil-based fuel. They are looking at it for hydraulic materials. Vegetable oil by definition breaks down more quickly than petroleum-based oil.

I have golf tees here that are totally degradable. Since I am a golfer, I kind of like those. Anyway, there is a number of products that can be made out of renewable materials that really show promise in the marketplace.

The impact of these 26 projects—and like I say, all of them are listed on this in the back of this testimony—is an initial gain of 600 permanent employees in rural America. Now, some of these will fail. We know that, but many of them we expect will be successful

in 2 to 3 years. In the longer term, over 10,000 jobs from these projects are expected to result. Materials utilization will involve several thousand acres of both traditional and alternative crops. Because of transportation costs, these will generally be processed close to where the crops are grown.

This new program can help turn agriculture around by moving toward a market-based industry and less on commodity support and export enhancement programs. The AARC center program holds the potential to reduce current Government outlays on farm price and income support. These initial projects represent the tip of the iceberg.

Why does this look promising now whereas it did not previously? It is not like we haven't looked at this area before. However, there are now some ideas coming together. The first one is more efficient technologies for processing and manufacturing—biotechnology, continuous fermentation, and chemical catalytic processes. In other words, we have technologies that allow us to convert renewable materials now in some cases even more efficiently than the fossil fuel materials.

Environmental and regulatory requirements for the Clean Air Act and water, landfill alternatives, disposability, and renewability. Nobody wants a landfill in their back yard. The life cycle concept is going to be the trend of the future and if people do not realize that, they are kidding themselves. In other words, things that we produce, the products, we have to work them back into our system. We cannot be dumping them in landfills.

Availability of skilled labor and resources in rural America. In other words, we have the resources there to do it.

Then the increased pressure to reduce agriculture subsidies.

Although established within USDA—and we have gotten this question many times—how does this differ from some of the other USDA agencies that are working in this area, particularly ARS, the Forest Service, and CSRS? Our main focus is on closing the gap between research results and commercialization. Rather than duplicating the work of ARS, CSRS, and the Forest Service, the center's role complements the role of researchers and other agencies by providing a vehicle for getting their advances to the market more rapidly. Indeed, the complementary nature of the AARC center's support can be seen in the number of requests it received to support projects that draws on research that is going on in these three agencies. Seventeen of the 26 projects in the final negotiations had these agencies' involvement.

Put more succinctly, the AARC center's signals come from the demand side, working in partnership with a private company and developing promising technologies that already have a clearly identified market. In other words, we come at it from the demand side and work back rather than the technology side. This is different from the work of USDA and universities and so forth where they are working on developing technologies.

In conclusion, small business will play a crucial role in rural development. The AARC center is structured to serve as a vehicle to expedite commercialization of research advances that are made in public or private labs either domestically or overseas. In other words, we look at technologies that are not just from the public

labs, but private companies, overseas, wherever. Rural development can be spurred, environmentally benign products manufactured for industrial and consumer use, biodiversity created in cropping patterns. With continued strong support from the Congress, the administration, and grassroots, the AARC center can be an effective vehicle to help firms, particularly small businesses, to transform opportunity into realities in using renewable resources to generate sustained rural development.

Thank you very much for the opportunity to testify. I would be glad to answer questions.

[The prepared statement of Mr. O'Connell follows:]

PREPARED STATEMENT OF PAUL F. O'CONNELL

Mr. Chairman and Members of the Committee, as director of the AARC Center, I value the opportunity to discuss the activity underway in USDA's Alternative Agricultural Research and Commercialization (AARC) Center. I envision considerable potential to expand the commercial use of agricultural materials (traditional and new crops, animal byproducts, and forestry materials) in industrial products. The result will be that farmers and other small businesses will generate jobs and economic activity. Much of the agricultural and forestry material will be processed in rural areas because of the bulky nature of the agricultural materials to be processed—hence, providing sustainable rural development based on the natural and renewable resources of rural communities.

Over the past 5 years, I have helped establish and administer programs such as the Sustainable Agriculture Research and Education (SARE) Program, the Regional Aquaculture Centers, the work of the Office of Agricultural Materials, and the AARC Center—all of which received high marks at the grassroots level. I have seen the tremendous progress that can be made working cooperatively with private entrepreneurs. My experience strongly suggests that small businesses and individual entrepreneurs are the key innovators in our economy. However, they often need financial support and managerial assistance.

BACKGROUND

One hundred and fifty years ago, most of our non-food consumer products and industrial raw materials were derived from plant matter in all its forms—fruits, vegetables, grains, grasses, bushes, and trees. The rest came from animal matter, and from inorganic (noncarbon-based) minerals like sand, iron, and other metal ores. Then came the discovery of fossil fuels, whose name derives from the fact that they are the fossilized remains of living matter. Like living matter, fossil fuels are organic (carbon-based) materials; they are composed primarily of hydrocarbons. But because they are dead matter, fossil fuels are called minerals: organic minerals.

In the mid-nineteenth century, hydrocarbons began to vie for industrial supremacy with carbohydrates from farm and forest materials. Coal, and later to a much greater extent petroleum, became the basic raw material of industry. Industrial uses of plant and animal matter stagnated.

Fossil fuels replaced renewable materials because they offered definite advantages. As fuels, they contain more energy by weight and volume, making them easier to transport and store. The liquid nature of petroleum, and the ease of liquefying natural gas, allow them to be transported cheaply over long distances via pipelines, and to be more easily converted into by-product chemicals. By 1970, petroleum had routed carbohydrates in virtually every product category, except for paper manufacturing. Oil accounted for 70 percent of our fuels and more than 95 percent of our organic chemicals.

Now, just 20 years after the age of oil reached its peak, we are seeing the pendulum swing back in favor of an economy based on farm and forest materials. In the 1980s and 1990s, we discovered the disadvantages of relying primarily on fossil fuels.

From an environmental perspective, all kinds of pollution, from acid rain to global warming, from smog to ground water pollution, have been linked to using fossil fuels.

From a political perspective, relying on distant lands for our energy needs imposes very high national security costs.

From an economic perspective, relying on imported raw materials when local alternatives are available at competitive prices, weakens local and regional economies.

In the 1990s, we may be witnessing a historic turn-around in the fortunes of renewable materials. The comparative economics of carbohydrates and hydrocarbons are changing. Advances in the materials and biological sciences are reducing the cost of manufacturing renewable materials while environmental regulations are increasing the cost of hydrocarbon-based products. Moreover, the growing environmental consciousness has prompted many customers to willingly pay a "green" premium for carbohydrate-derived, environmentally benign products.

WHY PRIVATE/PUBLIC PARTNERSHIPS

The challenge today is not a shortage of promising ways to convert renewable materials into useful products, but the lack of support for bringing them far enough along to attract private investment. According to Peter Cannon, chief executive officer of a Silicon Valley start-up company:

"For every dollar spent in a lab on research for a product, \$10 dollars are required to develop the research, and \$100 dollars are required to bring production on line."

Hence, we should think carefully before spending the first dollar in the research lab.

Examples of pre-commercial development activities include:

- identifying viable market needs;
- designing equipment;
- testing products for performance and consumer acceptance;
- obtaining regulatory clearance;
- scaling up prototype equipment to a commercial scale;
- verifying that the technology performs on a commercial scale, and
- developing technical, cost, price, and other economic data for financial institutions.

The rate of investment in these developmental activities for new industrial uses of agricultural materials in the U.S. is lower than in Japan and the European Community (EC), in part because the governments in these countries make more support available for commercialization. Private firms alone will not wait the 5 to 10 years that is generally required to obtain adequate returns on promising technologies. Typically, their time limit is 2 years or less.

In addition, many of these new uses have social benefits which the private sector cannot be expected to finance on its own, such as:

- substituting degradable for nondegradable materials—especially for one-time-use plastic containers;
- reduced air pollution—particularly in congested cities;
- value-added products processed in rural America creating jobs and economic activity;
- encouraging farmers to grow crops and animals for changing industrial markets, therefore, reducing dependence on current farm programs.

CURRENT ACTIVITIES

After a lengthy process of proposal announcements, submissions, external and internal reviews, board analysis, and site visits, the AARC Center is in the final stages of negotiations to fund 26 projects with the available \$10,000,000. Agreements have just been completed with 8 of the applicants; 12 more are in final stages of negotiation; and the remaining 6 will be completed within a month. The enabling legislation provides significant flexibility to the board in the type of arrangements the board can enter with organizations (e.g., cooperative agreements, grants, repayable grants, contracts, loans, interest subsidies, and venture capital). This flexibility is required to fit the needs of widely varying conditions of organizations with ideas for using agricultural materials in industrial products.

These successful applicants were selected from 407 proposals, requesting \$175 million in support from the Center. External reviewers indicated that well over half of the 407 proposals had merit; however, due to limited funds the board could fund only about 6 percent of the proposals.

Funding by the AARC Center is usually matched, at a minimum, on a one-to-one basis by the recipients. The current estimate for the 26 projects is that, on average, the recipients are investing \$2.67 for every \$1 provided by the AARC Center. The intent is for the private partner to decide which new use will survive in the com-

petitive business world—and that can best be determined by requiring successful applicants to provide a major share of start-up costs. When successful, the applicants are required to reimburse the AARC Center's revolving fund that was established in the authorizing legislation, not only for the funds provided but also an additional amount as recognition for the investment risk.

The 26 projects range from small start-up operations to large impact technologies. Included are 17 entrepreneurial small firms, 1 agriculture coop, 2 nonprofit organizations, 3 medium size firms, and 3 large firms. The projects range in size from \$10,000 to \$1,000,000.

These projects involve the use of 17 different plant and animal materials. They include animal fat, kenaf, waste paper, corn starch, soy meal, soy oil, crambe, industrial rapeseed, Canola oil, wheat, lesquerella, hesperaloe, cotton, milkweed, grass straw, perennial grasses, and low grade hardwood trees.

Products being derived from these renewal materials include: composite building material that looks like polished granite; pulp for use in cardboard and paper; automotive windshield washer fluid using ethanol; biodiesel; ethanol from perennial grasses and used newspaper; grass and flower seeding mats; degradable polymers for food packaging, personal care items, and medical products; compost; biodegradable oils for use in metal cutting, automatic transmissions, concrete form release agents, and marine and forest applications; furniture parts; exhibit displays; slow release pesticide carriers; pillows and comforters insulated with milkweed floss; and intermediate chemicals. These products are environmentally friendly and create demand for biodiversity on the farm.

The potential impact, if all 26 projects are successful (we know that the probability is high that some will fail), is an initial gain of over 600 permanent employees in rural America within 2 to 3 years, and a longer term gain of over 10,000 jobs. Materials utilization will involve several thousand acres of both traditional and alternative crops. Because of transportation costs, these raw materials will (in general) be processed into initial product lines close to where the plant and animal materials are grown, thus strengthening rural economies.

This new program can help turn agriculture around by moving more toward a market based industry and less on commodity support and export enhancement programs. The AARC Center program holds the potential to reduce current government outlays on farm price and income support. These initial projects represent the tip of the iceberg in terms of potential impacts.

A number of factors have come together to make the use of farm and forest materials in industrial uses more viable in the 1990s. They include:

- More efficient technologies for processing and manufacturing, i.e., with biotechnology, continuous fermentation, and chemical catalytic processes.
- Environmental and regulatory requirements for clean air and water, land-fill alternatives, disposability, and renewability.
- Availability of skilled labor and resources in rural America.
- Increased pressure to reduce agricultural subsidies.

UNIQUENESS OF AARC CENTER

Although established within the USDA, the activities of the AARC Center are distinctly different from the activities of other USDA organizations also engaged with new crops and alternative uses, most notably the Agricultural Research Service (ARS), the Cooperative State Research Service (CSRS), and the Forest Service (FS). Unlike ARS, CSRS, and FS which concentrate primarily on research, the AARC Center's main focus is on closing the gap between promising research results and commercialization. Rather than duplicating the work of ARS, CSRS, and FS, the Center's role complements the work of researchers in other agencies, by providing a vehicle for getting their advances to the market more rapidly. Indeed, the complementary nature of the AARC Center's support can be seen in the number of requests it received to support projects that drew on research work initially funded by ARS, CSRS, and FS; in fact, 17 of the 26 projects in the final negotiations stage had ARS, CSRS, or FS involvement previously and others had indirect connections.

Put more succinctly, the AARC Center's signals come from the demand side, i.e., working in partnership with a private company and developing promising technologies that already have a clearly identified market. That is distinctly different from the work of other USDA and university organizations that are involved in the earlier stages of the process, where they are conducting research to identify potential technologies—which may or may not have commercial value.

CONCLUSION

Small businesses will play a crucial role in rural development. The AARC Center is structured to serve as a vehicle to expedite commercialization of research advances that are made in public or private labs either domestically or overseas. Rural development can be spurred; environmentally benign products manufactured for industrial and consumer use; and biodiversity created in cropping patterns as exemplified by the 26 projects the AARC Center plans to fund this year. With continued strong support from the Congress, the Administration, and grassroots entrepreneurs, the AARC Center can be an effective vehicle to help firms, particularly small businesses, to transform opportunity into realities in using renewable resources to generate sustained rural development and agricultural biodiversity.

May 26, 1993

ALTERNATIVE AGRICULTURAL RESEARCH AND COMMERCIALIZATION (AARC) CENTER

Established March 18, 1992 by then-Secretary of Agriculture Edward Madigan, the Alternative Agricultural Research and Commercialization (AARC) Center is an independent entity within the Department of Agriculture charged with commercializing agricultural products for industrial use. Directed by a 9-member Board of Directors, composed primarily of private-sector business executives, the Center provides funding for projects in the final stages of pre-commercial development. The role of the Center and its Board is best summed up in the words of Senator Thomas Daschle, Chairman of the Senate Subcommittee on Agricultural Research and General Legislation: "...A great deal of good research on industrial uses of agricultural commodities has been carried out by USDA and others, but, with few exceptions, progress stops at the interface between research and commercial application. Closing this gap between development and utilization is what the AARC Center is all about, and it is the AARC Board's responsibility to develop programs and policies that most effectively close this gap."

To qualify for financial assistance, a project must produce an industrial product (non-feed, non-food, non-traditional fiber) from an agricultural material (traditional or new crop, forestry material, or animal byproduct).

Significant events of the AARC Center's first year include:

- March - Secretary establishes the AARC Center
- April - Inaugural Meeting of Board of Directors
- May/June - Eight public hearings held nationwide--200+ individuals and organizations testified providing grass-roots input concerning how the AARC Center could best facilitate product commercialization
- October - 400+ projects submitted for consideration in response to the AARC Center's request for pre-proposals

This fiscal year the AARC Center will fund about 26 projects, for a total expenditure of approximately \$10,000,000. The projects range in size from \$100,000 to \$1,000,000. Funding by the AARC Center is usually matched, at a minimum, on a one-to-one basis by the recipients. Final announcements of the FY93 project funding will be made in early summer 1993. The funding request for FY94 is \$20 million.

The AARC Center does not function as a grant program per se. The Board, in effect, operates a risk capital investment fund for taxpayers; hence, the broad expertise of the Board is actively involved in selecting commercially viable projects that can compensate the AARC Center when successful.

1993 AARC PROJECTS COMPLETED AND BEING NEGOTIATED

1. CONCENTRATED ACID HYDROLYSIS COMMERCIALIZATION

Raw Material: switchgrass or grain sorghum

Project Goal: The goal of this project is to convert biomass to fuel grade ethanol. Ultimately, this project could result in the production of other high value commodity chemicals from agricultural biomass.

* \$1,000,000 AARC Contribution
 \$7,000,000 Cooperators Contributions (est.)

2. SPECIALTY FIBERS FROM HESPERALOE SPECIES

Raw Material: hesperaloe (a new fiber crop)

Project Goal: The goal is to develop hesperaloe as a new source of fibers that can be used in the production of premium tissue and towel products. Successful commercialization could lead to the construction of a new pulp mill in the southwest and the replacement of imported fibers currently used by the industry.

** \$289,900 AARC Contribution
 \$285,000 Cooperators Contributions (est)

<u>Stage of Agreement Implementation</u>	<u>AARC Center</u>	<u>Cooperators</u>
Completed	\$3,976,000	\$14,508,450
* Final stage of negotiation	\$3,644,010	\$ 5,421,363
**Early stage of negotiation	\$ 759,900	\$ 2,495,770
Other projects	<u>\$1,620,090</u>	<u>\$ Unknown</u>
Total	\$10,000,000	\$22,425,583*

* Total excluding unknown amount for "Other projects" category.

3. BIOPLASTIC COTTON

Raw Material: cotton

Project Goal: This project proposes to introduce a gene into cotton that will allow it to manufacture a naturally occurring polyester, giving fabric produced from the plant the qualities of polyesters currently derived from petrochemicals. All aspects of the new plant would be totally biodegradable.

* \$242,000 AARC Contribution
\$454,950 Cooperator Contributions (est)

4. WASTE STRAW TO PULP

Raw Material: annual ryegrass straw

Project Goal: The goal of this project is to convert waste annual ryegrass straw to pulp. The straw pulp would partially replace wood fibers in the manufacture of linerboard--the flat sheet of brown paper used to make corrugated board used in shipping containers.

* \$350,000 AARC Contribution
\$359,000 Cooperators Contributions (est)

5. KENAF/RECYCLED FIBERS NEWSPRINT PROJECT DEVELOPMENT

Raw Material: kenaf

Project Goal: The project proposes to construct and operate a small newsprint mill in a rural community, using kenaf and recycled newspaper. This should help establish kenaf as a dependable source of fiber for such use and lead to the development of similar mills in other rural areas.

* \$100,000 AARC Contribution
\$100,000 Cooperators Contributions (est)

6. NEWSTONE

Raw Material: soybean flour and recycled newsprint

Project Goal: The project will manufacture and market a unique building material made from soybean flour and recycled newsprint. The material is an inexpensive composite similar in appearance to granite, but with the characteristics of wood.

\$1,000,000 AARC Contribution
 \$1,500,000 Cooperators Contributions (est)

Completed

7. ON-FARM COMPOST COMMERCIALIZATION

Raw Material: farm animal manures; animal bedding materials; corn-starch based restaurant materials; and municipally-generated yard waste

Project Goal: The product to be commercialized in this project is an agricultural grade compost which can be used to improve soil and food quality and which can help reduce reliance on chemical fertilizers. The project centers on the farm-based composting of agricultural and urban materials.

* \$200,000 AARC Contribution
 \$553,091 Cooperators Contributions (est)

8. WHEAT GLUTEN AND WHEAT STARCH BASED ADHESIVES, FILMS, COATINGS AND FOOD SERVICE PACKAGING CONTAINERS

Raw Material: wheat

Project Goal: The goal of this project is to produce new biodegradable polymers obtained from wheat proteins and wheat starches. The polymers would be used in the production of adhesives, films and coatings.

\$800,000 AARC Contribution
 \$851,250 Cooperator Contributions (est)

Completed

9. ADHERENT, STARCH-ENCAPSULATED PEST CONTROL FORMULATIONS

Raw Material: corn

Project Goal: This project proposes to produce pest control agents encapsulated in biodegradable starch granules derived from corn or wheat. The granules will be adherent and stick to plant surfaces and be resistant to wash-off by rain and wind, thus reducing the amount of active ingredient required.

* \$500,000 AARC Contribution
\$500,000 Cooperators Contributions (est)

10. AQUAFEX

Raw Material: alfalfa hay; costal bermuda; straw; manure

Project Goal: This project will commercialize a proprietary method of converting the raw materials into sugars for ethanol. The ethanol will be used in a number of ways, including fuel ethanol and as an octane-enhancer. In addition, protein co-product sales should result from the process.

\$250,000 AARC Contribution
\$406,200 Cooperators Contributions (est)

Completed

11. ETHANOL BASED WINDSHIELD WASHER SOLVENT

Raw Material: corn

Project Goal: Using non-toxic, biodegradable ethanol derived primarily from corn, this project will produce an environmentally friendly windshield washer solvent. Current solvents are based on toxic methanol.

\$400,000 AARC Contribution
\$945,000 Cooperators Contributions (est)

Completed

12. NON-WOVEN NEEDLE-PUNCHED MATS

Raw Material: kenaf, wood waste, grass seed

Project Goal: This project will manufacture and market mats made from kenaf fibers and waste fibers from the forestry industry. The mats will take a number of forms, including a "roll and grow" lawn seeding mat, an erosion control mat, an oil absorption mat, and a mat for molding rigid products.

\$ 800,000 AARC Contribution
\$3,100,000 Cooperator Contributions (est)

Completed

13. ACCELERATED RESEARCH AND COMMERCIALIZATION OF BIODIESEL

Raw Material: soybeans and tallow

Project Goal: This project will use various blends of biodiesel in a test engine to help set standards for emissions and engine performance.

\$140,000 AARC Contribution
\$130,000 Cooperators Contributions (est)

Completed

14. TELOMER DEVELOPMENT

Raw Material: rapeseed oil

Project Goal: This project will result in the telomerization of rapeseed oil. The telomer will be introduced to the marketplace, where it is anticipated to have wide use in the lubricant industry by enhancing viscosity improving agents, friction modifiers and anti-wear compounds.

\$480,000 AARC Contribution
\$490,000 Cooperators Contributions (est)

Completed

15. BIODIESEL: BEST AVAILABLE TECHNOLOGY SEARCH

Raw Material: soybeans

Project Goal: This is a study to help determine what the best available technology is for the production of biodiesel.

\$36,000

AARC Contribution

\$ 9,000

Cooperators Contributions (est)

Completed

16. DEVELOPMENT OF LESQUERELLA AS A DOMESTIC SOURCE OF HYDROXYLATED OIL

Raw Material: various species from the genus Lesquerella

Project Goal: The primary focus of this project is the agronomic production of lesquerella planting seed and the development of a network of relationships among government and private sector organizations. Lesquerella is a new oilseed crop that could provide products and derivatives for various industries, ranging from construction to pharmaceuticals.

* \$ 776,110

AARC Contribution

\$1,356,322

Cooperators Contributions (est)

17. BIO-FORM

Raw Material: rapeseed oil

Project Goal: The goal is to market a patented concrete release agent that is made from agricultural materials. The release agent is totally biodegradable and non-toxic and would replace current petroleum-based agents.

\$70,000

AARC Contribution

\$77,000

Cooperator Contributions (est)

Completed

18. CONTINUOUS CATALYTIC HYDROCRACKING OF CORN STARCH-DERIVED GLUCOSE INTO ETHYLENE GLYCOL, PROPYLENE GLYCOL AND GLYCERINE

Raw Material: corn

Project Goal: Using a patented process, this project will produce high value-added chemicals--industrial polyols--from renewable, natural carbohydrate resources--principally corn. Currently, these chemicals are petroleum based.

* \$600,950 AARC Contribution
\$601,000 Cooperators Contributions (est)

19. METHYL ESTER COMMERCIALIZATION PROGRAM

Raw Material: waste cooking fats and oils, inedible tallow, lard, inedible greases and poultry fat

Project Goal: The goal is to produce methyl esters that can blended with diesel fuel, making a type of biodiesel derived from animal byproducts. Biodiesel is viewed as a likely fuel alternative to help meet stricter emission standards.

* \$10,000 AARC Contribution
\$61,000 Cooperators Contributions (est)

20. MOLDED STRANDWOOD FURNITURE PARTS

Raw Material: wood strands flaked from pulpwood grade timber

Project Goal: This project will commercialize a process to make three dimensional, molded wood strand composite products. The initial product will be hidden furniture components requiring compound curvature. Use of molded furniture components can reduce the number of parts in a piece and, thus, the number of joints and fasteners subject to failure.

** \$ 315,000 AARC Contribution
\$2,155,770 Cooperators Contributions (est)

21. BIOMASS CONVERSION VIA DILUTE ACID/ENZYME HYDROLYSIS

Raw Material: biomass--agricultural waste material--and mixed waste paper

Project Goal: This project uses a family of patented, genetically engineered bacteria in a process that converts biomass and waste paper to sugars for fermentation into ethanol. The commercialization of this technology would provide a market for the raw materials and economically produce 30-50 billion gallons of ethanol annually.

* \$100,000 AARC Contribution
\$150,000 Cooperators Contributions (est)

22. STRUCTURAL PANELS FROM KENAF FIBERS

Raw Material: kenaf

Project Goal: The aim of this endeavor is to evaluate the use of kenaf fibers as a raw material in the construction of structural panels for stage and theater sets and convention displays, as well as their use in office dividers and furniture. Kenaf-based panels are an attractive alternative to current building materials used in the panel industry--especially for lauan plywood, which is imported from tropical forests.

* \$50,000 AARC Contribution
\$50,000 Cooperator Contributions (est)

23. COMMERCIALIZATION OF MILKWEED AND ITS PRODUCTS

Raw Material: milkweed

Project Goal: The company engaged in this work is dedicated to developing a major new industry based on cultivated milkweed. They already market comforters and pillows containing their own blend of milkweed floss and goose down. In addition to providing a substitute for goose down--a market currently controlled by China--the company envisions a market for milkweed pods and oil.

* \$ 125,000 AARC Contribution
\$1,050,000 Cooperators Contributions (est)

24. BIOLOGICALLY BASED PEST CONTROL PRODUCT

Raw Material: corn/cotton/sugar

Project Goal: Using corn flour as the medium, cotton flour and sugar--to serve as a feeding stimulant--are mixed with a variety of *Bacillus thuringiensis* (Bt)--a well-known pest control agent. The product is an effective biological pesticide that may likely reduce the use of restricted pesticides and improve worker safety.

* \$170,530 AARC Contribution
\$186,000 Cooperators Contributions (est)

25. BIODIESEL FROM WASTE FRYING OIL

Raw Material: waste vegetable oil from a potato processing plant

Project Goal: A semi-commercial pilot demonstration facility will be built for this project, the purpose of which is to test a new process for purifying alcohol esters of vegetable oils. In this new process, a water wash has been eliminated which will reduce a current water pollution problem. The process will also demonstrate another production for biodiesel--a fuel with considerable potential.

** \$125,000 AARC Contribution
\$ 58,000 Cooperators Contributions (est)

26. PRODUCTION OF INDUSTRIAL COATINGS FROM SOYBEAN OIL

Raw Material: soybeans

Project Goal: The goal of this project is the production of rubberized epoxy materials for various industrial coatings. These materials, derived from soybean oil, would replace current materials that are made with petroleum.

** \$55,000 AARC Contribution
\$55,000 Cooperators Contributions (est)

**Estimated Impacts of 1993 Projects Being Negotiated By the
Alternative Agricultural Research and Commercialization (AARC) Center**

<u>Projects</u>	<u>Job Creation</u>		<u>Materials Utilization</u>	<u>Environmental</u>	<u>Value Added</u>
	Initially	After 4 Yrs. Long-Term			
Ethanol & Other Chemicals from Lignocellulosic Materials	47	100 Several Thousand	Several million acres of marginal land in grass & trees potentially	Protect marginal lands	10X raw material costs
Specialty Fibers from Hesperaloe	4	23 1,400	New crop with large potential in Southwest	Low water needs; no harvest chemicals	4X raw material costs
Cotton Fibers with Bioplastic Properties	7	8 590	1 million acres of cotton	Biodegradable in the environment	---
Waste Straw to Pulp	210	455 1,820	300,000 acres of straw for first plant	Elimination of open burning	Several times raw material costs
Kenaf/Recycled Fibers Newsprint	108	130 180	3,000 acres of kenaf; recycled newspapers	Recycling of newspapers	10-15X raw materials costs
Molded Furniture Parts	25	63 71	Wood strands flaked from pulp wood grade timber	Improved forest management; improved wildlife habitat	20X raw material costs
New Stone from Soybeans and Waste Paper	64	298 5,600	280,000 bushels of soybeans	Recycling of waste paper	10 - 20X raw material costs
On-Farm Compost	7	200 4,000	Animal manure; animal bedding; yard waste; corn starch-based waste	Improved soil quality; improved groundwater quality	2 - 20X raw material costs

<u>Projects</u>	<u>Job Creation</u>			<u>Materials Utilization</u>	<u>Environmental</u>	<u>Value Added</u>
	Initially	After 4 Yrs.	Long-Term			
Films and Coatings from Wheat	5	5	20	30 million lbs wheat gluten; 80 million lbs wheat starch	Biodegradable products	2X raw material costs
Starch-Encapsulated Pesticides	12	40	60	200,000 acres of corn	Biodegradable product; lower pesticide rates	10X raw material costs
Biomass Conversion to Sugars for Ethanol	...	...	...	Perennial hay; agricultural waste	Recycling of waste products	10X raw material costs
Windshield Washer Solvent from Ethanol	7	28	156	24 million bushels of corn annually	Safer and biodegradable product	2 - 3X material costs
Lawn Mats from Kenaf	46	56	112	50,000 acres of kenaf	New crops and reduced demand for trees	3X raw material cost
Biodiesel Research	...	...	...	Various blends of biodiesel derived from plant and animal sources	Establish engine standards for emissions and performance using biodiesel	...
Upgrade Seed Oil Based Lubricants	13	26	52	120,000 acres of crambe/rapeseed	Break down in marine or forest environment; new crop	3 - 5X material cost
Best Technology for Biodiesel	...	...	...	Vegetable Oils	Reduced air pollution	[Study of various production technologies]
Specialty Lubricants & Cosmetics from Lesquerella	5	15	300	100,000 acres of Lesquerella	New crop; biodegradable products	2 - 3X seed value
Concrete Release Agent	3	3	3	Rapeseed	Biodegradable product	2X raw material costs
Poly Chemicals from Corn Starch	14	49	400	227,000 acres of corn	Replace synthetic products	2X times raw material costs
Biodiesel from Animal By-Products	29	72	220	Waste cooking fats/oils; tallow; lard; poultry fat	Reduced vehicle emissions	1.5X raw material costs

Senator WELLSTONE. Thank you, Mr. O'Connell. I appreciate your testimony. I will later on ask you to maybe go through from beginning to end some success stories because I think part of the importance of your testimony is some concrete models of what is working right now.

Mr. O'CONNELL. Yes.

Senator WELLSTONE. I think we really need to get that out there and promote that.

Mr. O'CONNELL. I would be glad to do that.

Senator WELLSTONE. With the patience or indulgence of the two of you, I would like to recognize Senator Kohl and have him make an opening statement. I also am joined by my other colleague, Senator Burns. I thank the two of you for being here.

Senator Kohl.

STATEMENT OF HON. HERB KOHL, A U.S. SENATOR FROM THE STATE OF WISCONSIN

Senator KOHL. Thank you very much, Senator Wellstone. I am very pleased to be here with you and Senator Burns today in calling attention to the importance of sustainable or alternative agriculture. In my view sustainable agriculture is more than a tool of agricultural policy and more than a part of environmental policy. It can also be a very essential feature of economic development policy in our country.

For decades we have measured the success of agricultural policy by a simple yardstick and that is quantity. To increase quantity, we have consistently depleted our soils and increased the use of synthetic fertilizers and pesticides. These practices have been justified by the need to achieve ever-increasing yields from an ever-diminishing variety of crops. That strategy worked in terms of increasing quantity, but it also increased concerns about environmental degradation. It decreased consumer confidence in food safety, and in my view it contributed to the social disintegration of our rural communities.

These concerns, concerns shared by farmers themselves, should cause us to change our national agricultural policy. Government should be a leader in making these changes.

Unfortunately, Government policies have acted more as a protector of the status quo than a force for change when it comes to encouraging and supporting the use of sustainable agricultural systems by our Nation's farmers. That must change, and I believe that it is changing, however slowly.

There are bright lights of hope, and one of those lights is the ongoing research into sustainable agricultural systems. Congress has established programs like the Sustainable Agriculture Research and Education program, formerly the LISA program, to foster research into sustainable agricultural systems. We have told the Extension Service to tell farmers about how they can use that research.

I am also encouraged by the host of new direct marketing opportunities that have come in partnership with the sustainable agriculture movement. Marketing of low input or organic produce directly from the farmer to the consumer brings much needed diver-

sity to our rural economies and gives the farmer a greater return on his product.

But Congress has not fully funded the programs established to encourage alternative agriculture, and previous administrations have not fully supported them either.

Despite these failures, I am proud that Wisconsin farmers and institutions have played a leadership role in promoting sustainable agriculture. But the cultural change that is taking place at the farm level in Wisconsin and elsewhere must be better facilitated by the Federal Government. As a new Member of the Agriculture Appropriations Subcommittee, I will be working with Chairman Bumpers to adequately fund these programs.

I want to congratulate my colleague, Senator Wellstone, for holding this hearing to highlight the promise that sustainable agriculture offers to rural America. I look forward to working with him and other Members of this Subcommittee to pursue the themes discussed here today.

Before I hand the microphone back to Senator Wellstone, I would like to welcome Margaret Krome from Wisconsin. She is the Agriculture Policy Coordinator of the Wisconsin Rural Development Center. She is an outstanding woman who has contributed a lot to what we are doing here today, and I have enjoyed working with you and look forward to working with you in the future, Margaret.

[The prepared statement of Senator Kohl follows:]

PREPARED STATEMENT OF SENATOR KOHL

I'm glad to be here today to join my colleague Senator Wellstone in calling attention to the importance of sustainable or alternative agriculture. In my view, sustainable agriculture is more than a tool of agricultural policy, more than a part of environmental policy; it also can be an essential feature of economic development policy.

For decades, we have measured the success of agricultural policy by a simple yardstick: quantity. To increase quantity, we have consistently depleted our soils, and increased the use of synthetic fertilizers and pesticides. These practices have been justified by the "need" to achieve ever-increasing yields from an ever-diminishing variety of crops.

That strategy worked in terms of increasing quantity. But it also increased concerns about environmental degradation. It decreased consumer confidence in food safety. And, in my view, it contributed to the social disintegration of our rural communities.

These concerns—concerns shared by farmers themselves—should cause us to change our national agricultural policy. Government should be a leader in making those changes.

Unfortunately, government policies have acted more as a protector of the status quo than a force for change when it comes to encouraging and supporting the use of sustainable agricultural systems by our nation's farmers.

That must change. And I believe that it is changing, slowly.

There are bright lights of hope. And one of those lights is the on-going research into sustainable agricultural systems. Congress has established programs like the Sustainable Agriculture Research and Education program (formerly the "LISA" program) to foster research into sustainable agricultural systems. We have told the Extension Service to tell farmers about how to use that research.

I am also encouraged by the host of new direct marketing opportunities that have come in partnership with the sustainable agriculture movement. Marketing of low-input or organic produce directly from the farmer to the consumer brings much needed diversity to our rural economies, and give the farmer a greater return on his or her product.

But Congress has not fully funded the programs established to encourage alternative agriculture, and previous Administrations have not fully supported them, either.

Despite these failures, I am proud that Wisconsin farmers and institutions have played a leadership role in promoting sustainable agriculture. But the cultural change that is taking place at the farm level in Wisconsin and elsewhere must be better facilitated by the Federal Government. As a new Member of the Agriculture Appropriations Subcommittee, I will be working with Chairman Bumpers to adequately fund these programs.

I congratulate my colleague Senator Wellstone for holding this hearing to highlight the promise that sustainable agriculture offers to rural America. And I look forward to working with him and other Members of this Subcommittee to pursue the themes discussed here today.

Senator WELLSTONE. Thank you, Senator Kohl. Those words from a Senator with such a strong business background are important, and it certainly is true that both AARC and SARE will be considered in Senate agriculture appropriations in this next month. I know there are a number of us that really do strongly support expanding the funding for these programs.

Senator Burns.

STATEMENT OF HON. CONRAD BURNS, A U.S. SENATOR FROM THE STATE OF MONTANA

Senator BURNS. Thank you, Mr. Chairman, and thank you for holding these important hearings. I have a statement that I want to enter into the record. I just want to pass along a couple of comments.

I am always amazed at folks who talk about sustainable agriculture, and I am always amazed at people who would sometimes take a look at our agriculture as a given, so to speak, of great production. Most of that production, however, was not done on the advice of a county extension agent who sometimes has difficulties in dealing with new methods. We have an agriculture community now that has turned into being an enforcement agency rather than a support agency, and that concerns me.

At Montana State University we are on the cutting edge of biodiversities and biosciences as far as using fungus for the control of weeds and, of course, for the control of pests. We know we have to move away from chemicals. It has to be done. We have been on the leading edge of that at Montana State University for many, many years. Research was conducted in grasshopper control, doing it in a biological way. Also, there was research about the control of weeds that you have not heard about here. That is not a sexy issue. You do not come to town and talk about weeds because that is not going to get you headlines in the Washington Post, but it is one of the most serious problems that we have. So, we are proud of what we are doing.

We are also proud of what we are doing in the area of telecommunications infrastructure as far as rural development is concerned. The CRP has done more to destroy our small communities than just about any farm program we have had. CRP has not helped our communities. It might have helped the farmer or the absentee owner, but it has not helped the communities which depend upon an agricultural output or production. So, we have to look at those areas and how do we do it socially.

Anytime you look at an issue, there are three questions you have to answer. You have to answer social, economic, and of course political questions before it can be viable or it can work in rural

America. I know what rural America is like. I was born and raised in a town of 1,700 people. That is 3 miles outside of that in Missouri. I also live in Montana where we probably drive further for our cup of coffee in town than a lot of folks.

So, we understand the relationship of sun and water and soil and what that relationship is and what it is to this society. This society is quickly moving to a time when our grandkids will be hungry. I can guarantee you that with the policies that we are putting in place now, and that is too bad.

Les Melrow who is a citizen of North Dakota, Minnesota and Wisconsin, said if you want to give me ideas that work, go out to a shop in Minnesota or North Dakota and find a kid who will tinker, and he will build you a piece of machinery or come up with an idea that will work. It is not always done in the labs of America.

So, Mr. Chairman, I really appreciate these hearings, and I look forward to the testimony. I really believe in what this Committee can do for rural America. I think we can do a great deal, and I thank you for the opportunity. I thank the witnesses for coming.

[The prepared statement of Senator Burns follows:]

PREPARED STATEMENT OF SENATOR BURNS

Mr. Chairman, thank you for holding this hearing today on rural economic development. Far too often our country tends to concentrate its efforts on big or corporate business. But, 80 percent of U.S. businesses pay taxes as individuals, not as corporations. So if we want economic growth, we must concentrate on economic development.

Generally speaking there are two suppliers of jobs: one is private business—corporate or small—and the other is government—Federal, State and local. But policy makers seem to forget that it's the first—business—that pays for the second—government. And it's plain and simple, government does not create wealth or jobs!

In my home State of Montana, small business makes up 98 percent of all businesses. In Montana and throughout the Nation, rural economic development is one key in allowing existing businesses to grow and in creating new businesses. Nationally, from 1988 to 1990 small businesses with fewer than 20 employees created 4.1 million new jobs. During the same period businesses employing more than 500 employees had a net loss of 500,000 jobs.

This week conferees from the House and Senate will begin meeting on the budget, and we all know that this budget will do nothing but strangle existing small businesses and discourage the creation of any new businesses and jobs.

A budget is going to pass which will increase the tax rates on businesses, phase out deductions, and establish additional taxes—including the tax which will devastate rural America, the dreaded energy tax. We must look for more innovative means of job creation through small business. Many people may not realize that agriculture is a business, and in Montana it is very important to our communities' stability.

I, along with some of my colleagues, have asked President Clinton to hold a farm and rural development summit. A summit to highlight the difficulties in rural areas would help policy makers develop a strong plan to solve our problems. Some issues the summit could address are government interference, unfunded mandates, and private property. Most Montanans have strong opinions on all three of these issues. Having the Federal Government breathing down your back and the continuous layering of government regulations confronts small businesses, including farmers and ranchers daily. But, nothing, and I mean nothing, concerns these Montanans more than the total disregard of private property rights.

Also, the diversification of agriculture will help this industry survive. Bad weather, pests, and disease often get the best of some producers. The development of new techniques and new crops are two areas which are of special interest to me because they hold the key to lessening the difficulties in the production of our food and fiber.

There are a number of projects in Montana which are of interest in the development of rural economies. One is the bio-science center at Montana State University. The center has begun to explore ways to use biotechnology for the improvement of

crops. Currently, they are conducting research to form a new strain of wheat that is resistant to frost. And we have a need to control plant diseases and pests with means other than chemicals. These types of projects will enhance rural development because they will help agriculture to grow. In Montana, rural development is hinged on agriculture.

I look forward to hearing today's witnesses and their ideas on agriculture and rural development.

Senator WELLSTONE. Thank you, Senator Burns.

If I am correct, we have a vote at 10:30 a.m. So, why don't each of us limit our questions to 5 minutes or so and we will try and get done with the first panel and move on to the other panel, although I do not know that that gives it justice. Let's take a crack at it.

Mr. Bird, let me have you focus in on one of the questions that I raised at the beginning. Is sustainable agriculture a promising strategy for rural economic development? Senator Burns was alluding to that. In other words, putting aside the questions about pesticides, health, safety, and environment, as an economic development strategy, is it a promising strategy for rural America?

Mr. BIRD. Yes. My observations during the past 2 years are that for revitalization of rural America there has to be a very, very strong link with the agricultural portion of that particular community. Some examples are things like agricultural supported communities. There are not too many throughout the country that actually go by that, but there are some.

There is another sort of movement in the area called community supported agriculture. Within the past month or so you have seen in some of the news some items on organic cotton, and right now one of the constraints there is there are not specific gins for that throughout the cotton producing area. There are not mills. These were disassembled years ago. So, much of this structure has to be put back for the local value added that is an essential component of sustainable agriculture that seems to be developing.

Senator WELLSTONE. What kinds of small business opportunities are there that are associated with this?

Mr. BIRD. The first one that comes to my mind relates back to the pest management standpoint, biological control. Biological control is going to be very specific to local needs, and where I see that really working, it is succeeding because of small businesses that are locally dedicated toward that. Other parts of the country with the exact, same pest problems that lack these small businesses do not seem to have this working.

The machinery aspect that you related to, Senator Burns, is another very good example. The machinery is going to be far more regionally specific for sustainable agriculture than for the industrial agribusiness model of agriculture.

Senator BURNS. I think essentially it always has been, though.

Mr. BIRD. I believe that is true, but I think we may have gotten a little bit away from that. We have many examples throughout the country where our major supporters of sustainable agriculture are machinists and spend a lot of time engineering their own equipment and then getting people to manufacture that for neighbors.

So, there are many, many examples across the entire spectrum of the needs of agriculture for small business, the local value added and the marketing of these local value-added products. I will mention Bob Quinn from Big Sandy, MT. His operation is an excellent

example where he had the markets, but to get the quality of product on the markets, he had to provide the local small business for the manufacturing of those products. He was basically a farmer to begin with.

Senator WELLSTONE. Mr. Bird, if this is all right—and I am going to say the same thing to Mr. O'Connell—I have literally 30 minutes worth of questions that I would like to submit to you that I would like to get some response to that I will not be able to get to today.

Mr. BIRD. Yes.

Senator WELLSTONE. Mr. O'Connell, let me make one kind of macroeconomic, philosophical point, and then I want to ask one question that is very concrete. Many rural economic development strategists nowadays tell us that agriculture is not going to provide a lot of significant new jobs or income for rural America, and we hear this even from some development economists within USDA. Should we bother with agriculture as a basis for rural economic development? I think I know the position of those of us on this Committee, but I would like to flesh you out on this point because it is a question I think we need to directly deal with.

Mr. O'CONNELL. Right. If you look at statistics, if you just look at what has happened over the last 30, 40, 50 years, there is no question that economic activity based on renewable resources within our local communities has declined, and there have been small communities all over the country that have looked for some kind of an outside firm to come in, an electronic firm, whatever the case might be. The small community will invest in—give them tax breaks and everything. That company will be there for 3 or 4 years and go on. So, you can look at the trends, and I can see why analysts will say, well, gee, agriculture is not going to provide the opportunity.

I would argue that with some of the reasons that I gave in my testimony and with some of the way that a lot of people out in the agriculture community are looking at it now, that I think we can turn that around. That is the view of organizations like the National Corn Growers and Association of Soybean Growers. Organizations like Archer Daniels Midland and Cargill. A lot of these organizations are beginning to see that now is the chance to start adding value. All these products I am talking about here. The 26 projects that we have here, and most of them with small firms. I am not just talking about Government money. At least half this money is invested by the private sector. In other words, why would they be putting money into something unless they thought they were going to get something out of it?

I would argue that our focus has been kind of on the wrong place. We have been investing public money in infrastructures, roads, and waste treatment plants, and a whole lot of things. I would argue that we should be putting our emphasis on finding those opportunities with agricultural and forestry materials where they have an advantage in today's economy. where we now have technology that allows us to convert this economically.

I have heard that same argument. I have been in meetings in the Department with rural development people, and they say there is just no hope for agriculture. But I think if they start taking a hard look at it and with today's pressures and we look out toward the

future, I would disagree with that strongly. These folks that are investing in these projects—and we have others—would not be putting money into them. So, I think it is a matter of searching these promising areas out and focusing on them.

It is just like economic development corporations in States in places like Iowa and Kansas and Indiana. They are not funding many agriculture-related projects because people have this idea that products base and renewable materials just is not a promising economic activity, but I can tell you they are.

Senator WELLSTONE. I think that the premise of this Subcommittee is that agriculture remains the foundation of the country's rural economy and that it is key to our future renewable resource base and that there are exciting new use and sustainable agricultural opportunities, small business opportunities.

Could you very briefly, because I am about out of my time, take preferably an SBA project and talk about the ways in which AARC has worked with that, just one concrete success story, maybe just in a couple of minutes, and then we will move right on to Senator Kohl?

Mr. O'CONNELL. I will use the NewStone project from Mankato. Now, it was not an SBA funded project. It may have been, but I know it was AURI. The AURI from Minnesota put money into this, and also the soybean growers put money into this, and also the private investor. They put some development type costs into it.

By the way, this product did not come from our public labs, referring back to the comment before. This idea came from a science project by a young lady about 12-13 years old. Then the people at Mankato State University developed it, but the initial idea for this came from a science project.

Well, anyway, they got money from AURI's development people in Minnesota. Also the soybean growers put about \$300,000 into it. They got an investor to put about \$1.5 million into it. They got to the point where they could demonstrate they had a promising product. You can put this in furniture and so forth. So, that is where they got their start, both private investors, and it could have been SBA. But it is the same kind of a thing from AURI.

Then they were at a point where the investors said, hey, we are just not going to put any more into it. It is too much. That is when they came to us. So, when they came to us, they came to us for \$2 million, but we could only put \$1 million into it. But then once they had our commitment—and that is true in almost all these projects. We require 50 percent up front from other sources, but once they had our commitment, then other investors said, well, gee, if that program is willing to put some into it, the other investor decided to put \$1.5 million into it. So, they were then able to go out and get \$1.5 million, and it looks like they will get some more money. So, they leveraged off of our commitment to get this going.

Now, what NewStone people are going to do with this is set up a production line, inventory, and marketing activity. They already have sales for a furniture company in Michigan I believe to sell this product, but what they have to set up is a production line. That is what they are doing with AARC money.

So, it had some initial start with AURI, the Minnesota development corporation which you are familiar with, similar to SBA, and

then we came in to actually get the whole thing on line. They have not sold any products up until now. What we are trying to do is to help them get going so products can be sold. That is true of almost all these things that I have here, all the 26 projects, that kind of an opportunity.

Senator WELLSTONE. Thank you. AURI is the Agriculture Utilization Research Institute which does a lot of, Senator Burns, outreach out in cafes talking to people about what their ideas are. I think you would love their approach.

Senator Kohl.

Senator KOHL. Thank you much, Senator Wellstone.

Mr. O'Connell, as you review proposals through the AARC board, do you look at how proposed products support community-based concerns, and how do you look at these products specifically in terms of their benefit to family farmers?

Mr. O'CONNELL. We have basically four fundamental aspects that we look at when we look at a project. First of all, if the private sector is going to invest in this, are they going to make money? Are they going to survive over the long term?

We also look at the technology. Is the technology sound and is it something that is going to work?

We also look at the business plan and see whether that works, but also very important of equal status is the impact of this on family farms, on the environment, and on the local community. That is a very strong part of our decision.

Notice in my testimony I indicated 18 of these are with small firms. They are with small entrepreneurs, and that is where most of the new ideas are coming from. By design and in the legislation, it indicates that we need to move more in that direction. So, small firms and by definition almost, these products, in fact the ones that we are funding, have to be close to the raw materials. So, small firms and relatively small communities that we are working on. With NewStone and a number of these, that is the case.

Then on the impact side, one of the most important things for sustainable agriculture is that they have a diversity of products that they can sell. One of the more promising projects that we have—three of them we have—is getting ethanol not from corn, but from lignocellulose, perennial crops on CRP land, for example. It could come from grasses. It can come from bushes. It can come from trees. It can come from waste material that is going into a landfill or waste paper. We are funding three of those.

One of them is where the private company is putting up \$7 million. We are only putting up \$1 million. You say to yourself if they have \$7 million, why are they even bothering with us. Because if the other investors and the financial community know that we are investing in it, they figure that, well, there must be something worthwhile about it.

But if we can find markets for products that we grow on our set-aside lands, that is the most promising thing that we can do for sustainable agriculture. So, yes, we seriously consider those concerns that you talked about.

Senator KOHL. Very good.

Mr. Bird, to what degree has the historically low funding level for sustainable agriculture programs like the SARE program affect-

ed the capacity of these programs? How many proposals do you have to turn down for every one that you accept, for example?

Mr. BIRD. Well, we have not been able to fund anywhere near the number of excellent proposals or proposals that we would like to fund. I can get you a specific figure. I do not have that in my head. But basically if we use the pre-proposals, we probably get about 10 times as many as we fund, and then we only request full proposals for some that are pre-proposals. We fund about one out of four of those.

Areas such as the quality of life and economic assessment issues have been much slower in coming on line because of lack of resources. We really have not gotten into, from the SARE program, the environmental impact assessment area that is mandated in the farm bill.

Senator KOHL. Would you both say that sustainable agriculture, in terms of where we are and where we want to be, is in its earliest infancy, or where are we on this?

Mr. BIRD. I very definitely think that we are in the beginning phases, but I would also like to say that sustainable agriculture is also a catalyst for the broader area of sustainable development.

Mr. O'CONNELL. I would just like to comment. I was involved in setting up the sustainable program back in the middle to late 1980s. In that time period it was difficult to talk about this without getting eggs and tomatoes thrown at you. I am not running the program right now. But I will tell you there has been a big change out there in attitude toward the concept of sustainable agriculture. But for realizing its full potential, it is still in its infancy.

Senator KOHL. Are many or most farmers a long way from understanding—

Mr. O'CONNELL. I would say that most farmers have made some adjustments. Even the most conventional farmer has begun to reduce the amount of commercial fertilizer and pesticides they had been using. How much pesticides are really needed to do the job? I would argue that a lot of that has gone on. You can see that in statistics that come out of the Department. So, I would say all of agriculture has taken a hard look as to how they are doing their business. But so far as realizing all the potential benefits of what I would call sustainable agriculture, we still have a ways to go.

Mr. BIRD. Compared with 5 years ago, it is a very teachable moment. I find very few people in the agricultural community that are not willing—everybody today is willing to listen to a much broader range of issues than maybe 5 years ago.

Senator KOHL. Just to understand, you are saying that the whole area of sustainable agriculture today is very, very much in open stages of people understanding it, recognizing it. They're receptive.

Mr. O'CONNELL. They are beginning to listen.

Senator KOHL. They want to listen. There are not nearly as many closed minds as there used to be.

Mr. O'CONNELL. I was just at a session up in Bismark, ND. I just came back. The Secretary was there and Senator Conrad was there. The whole morning session was on sustainable agriculture. Fred Kirchman, an organic farmer, was there and spoke to 12 secretaries of agriculture, all from the midwestern States.

Mr. BIRD. There are some exceptions, but in general that is very true.

Senator WELLSTONE. The ranking minority member of the Small Business Committee, Senator Pressler is here. Senator Pressler, do you have a statement you would like to make?

STATEMENT OF HON. LARRY PRESSLER, A U.S. SENATOR FROM THE STATE OF SOUTH DAKOTA

Senator PRESSLER. I would like to just briefly say that on the next panel I want to extend a warm welcome to Dr. Don Taylor from my home State of South Dakota. Dr. Taylor is a professor of agricultural economics at South Dakota's leading agricultural institution of higher education, South Dakota State University, and is an important member of a research team that has been studying alternative agriculture for the past 9 years. I am listening to these witnesses and I have some questions for the record. However, I am jumping between three committees this morning and I also have a markup going on. I hope I am back here to hear Dr. Taylor, although he is in the next group. So, I am going to do my best to return. I thank you very much and I am very interested in this subject.

[The prepared statement of Senator Pressler follows:]

PREPARED STATEMENT OF SENATOR PRESSLER

Good morning. Let me begin by thanking the Chairman for calling today's hearing. It is the job of this Subcommittee to explore ways in which economic development can be enhanced in America's heartland—in our rural areas and small cities. That job necessarily includes fostering growth on America's small farms and ranches. In my home State of South Dakota, over 97 percent of businesses are farms and small businesses.

As our farms and rural communities struggle to survive, we must explore new avenues to advance their economic growth. Development of nontraditional uses for farm, ranch and forestry products provides an opportunity to improve U.S. competitiveness in foreign markets, create development and employment opportunities in rural areas, address environmental concerns and lower farm program costs. Farming practices such as sustainable or organic agriculture may provide one path to economic development. Today, we seek to determine whether these options can be profitable and whether they can bring our rural areas the growth they need.

However, while seeking economic development we must encourage safe farming practices. That is another issue for us to consider during today's hearing. The future of successful farming involves protecting the environment and preserving our non-renewable resources. Producing safe and healthy products must be a priority, as well.

Agricultural practices that sustain the environment can bring long-term growth, which in turn, could preserve our capacity to compete in international markets. If we use common sense and foresight now, our family farms and ranches will prosper for generations to come.

I would like to extend a warm welcome to Dr. Don Taylor from my home State of South Dakota. Dr. Taylor is a Professor of Agricultural Economics at South Dakota's leading agricultural institution of higher education—South Dakota State University—and is an important member of a research team that has been studying alternative agriculture for the past 9 years. I would like to welcome our other witnesses as well and say that I look forward to hearing from them.

Senator WELLSTONE. Well, I just would like to thank you, Senator Pressler, for being here as the Ranking Minority Member of the Small Business Committee. It is important to me that you have been able to put in some time here.

Senator Burns.

Senator BURNS. I just have a couple of questions.

They said the only way you can save the family farm is to only build a tractor of 65 horses and below because agriculture is going to continue to grow. Yet, we have people come to Montana who say we are going to do it the new way, and they go broke. We are still on horseback out there, and that is the way you kind of got to do it if you want to maintain.

I happen to believe that the infrastructure—when we talk about rural development, we also talk about the renewables and some of the things that we throw away. I know one of the biggest exports out of Minneapolis, MN is the screenings out of the mills that are sent to Europe and used in other ways. I know a man who has gotten very, very wealthy buying screenings and hiring a barge there on the Great Lakes, and he ships it all there. It goes into plastics. It goes into a various amount of product in Europe, and there is a great market for that. We have not stemmed that.

Mr. Bird and Mr. O'Connell, you may have to write me on this, but I also sit on another committee of science and technology on the Commerce Committee and NASA. The other day we had a hearing on new materials. We are going to see new materials. You just held one up there.

Mr. O'CONNELL. Yes.

Senator BURNS. Rules, regulations, and tort reform and mostly tort reform because of a new product and the gamble of taking a new product to the marketplace is always a fear. In other words, I believe in the partnership that we have to form between Government and a small entrepreneur who has an idea to get it into the marketplace because if something goes wrong, then he is out of business because we have acres and acres. If you want to do a favor for the country, close every law school in America for the next 25 years.

[Laughter.]

Senator BURNS. But I am saying that is a fear.

I am not real sure if you had go out here and hire people right now if you had the best idea in the world and it is from the demonstration side into the production side—how much of a problem is that out there with hiring people, rules and regulations, compliance, and tort reform? How much does that hold people back whenever we talk about real development of a new product?

Mr. O'CONNELL. There is no question that is a major barrier, but one of the key things—and this is especially true with small entrepreneurs—is helping them do the initial testing. In other words, the initial testing to meet the requirements of the city ordinances, county ordinances, State, and EPA. There is certain testing you have to do. Is it going to have toxic effects when you handle it or isn't it, and so forth and so on? That is only one of them, though.

The other one is for the thing that you are talking about. When you sell a product like this one right here, the first thing people ask is, is this thing going to break down when you put it in water? If I am going to use it in furniture and I wipe it off with chemicals and stuff, is it going to break down, all those kinds of things?

Now, Roger Porter is on our board, and he is a material scientist. But one of the things that we help with more than anything else is ensuring they do the testing that is required. Like on these products right here, this is over in the Cooperative State Research Serv-

ice in the industrial program where I was before I came here. We are working with NADIC, which is the Army lab up in Boston doing the testing for the Defense Department. I tell you if we can do all the testing and meet all their specifications, then whoever sells this product on the consumer market and a lawyer comes in and talks to them about it, they have all that stuff behind them. That is the best thing they can do to overcome the fear that comes from being sued.

Now, I agree with you. I think we have entirely too many lawyers. We do not have enough chemical engineers. I wish we could change the ratio. Chemical engineers is what we need to do this stuff.

But the best thing we can do for small companies is to test these products, help them to test it in the ways that we need. For example, on this product, when the small company that came out with this oil transmission fluid made out of crambe and rapeseed, we provided the money to get that product tested the same place you test traditional oil products. That was the most important thing that he could have in order to sell that product to transmission outlets. So, the key thing that we do with small companies is to help them get the testing data to satisfy the regulations that are in cities, State, county, and whatever, and then also the people that are going to buy the product. That is just a fact of modern life. You cannot change it.

Senator BURNS. By the way, he may call it rapeseed, but there are a lot of other folks that call it canola, just to show you I have been down that street too.

Mr. O'CONNELL. That's right. You have industrial rapeseed, as you well know, and you have canola which is for food.

Senator BURNS. I am just saying that we as a Government have put those rules and regulations out there.

Mr. O'CONNELL. Absolutely.

Senator BURNS. And some of them have been frivolous, but nonetheless, they are very, very costly. In fact, the other day—

Senator WELLSTONE. Senator Burns, you and I probably could pair. I bet we will vote differently, but we ought to go vote.

Senator PRESSLER. Could I just get in one quick question?

Senator WELLSTONE. Please do, and I will go vote. Then we have an excellent second panel. We will be right back.

Senator PRESSLER. It is my understanding that South Dakota is in the middle of a competitive bidding process to be the host site for a regional AARC office.

Mr. O'CONNELL. That is right.

Senator PRESSLER. Could you please tell me where the process is at and what criteria are being used to evaluate the proposal?

Senator WELLSTONE. I definitely should come back for this question.

[Laughter.]

Mr. O'CONNELL. I just had a meeting out there 2 weeks ago and they had a meeting in Brookings, SD. The representatives from Minnesota and North Dakota, South Dakota, and possibly Montana and Wyoming developed criteria, about six criteria. The people in those four or five States developed this criteria and together, using that criteria, they are going to ask the people in all those States to

put in their proposal where the site is going to be. Then they are going to select where it is. So, it is going to be a totally open process. I do not have the criteria right in front of me, but things like access to resource people and things like that. They should know by the middle of August where it is going to be, but they are going through an open process and South Dakota, I guarantee you, is a full part of the process.

Senator PRESSLER. Thank you.

[Recess.]

Senator WELLSTONE. Why don't we move on? I think we may also be expecting Chairman Bumpers to drop in.

You all look kind of crowded.

[Laughter.]

Senator WELLSTONE. But you look really impressive. It looks like a show of strength.

[Laughter.]

Senator WELLSTONE. Let me introduce Ron Kroese, who is Executive Director of the Land Stewardship Project. Does it put me in a conflict of interest situation to say that my daughter-in-law works for the Land Stewardship Project? I don't think so.

Don Taylor, who is Professor of Agricultural Economics, South Dakota State University, and we already heard Senator Pressler's laudatory remarks about the university and your work. Kathy Ozer, Executive Director of the National Family Farm Coalition; Jim Lukens, Program Manager, Appropriate Technology Transfer for Rural Areas Program. Thank you very much for being here. And Margaret Krome that Senator Kohl had already introduced is Agriculture Policy Coordinator, the Wisconsin Rural Development Center.

I thank all of you for being here. Let me just repeat one thing that I said at the beginning about our hearing today. I do not take your time for granted. Some of you have come from afar, and I said to Senator Bumpers that I was very excited about chairing this Subcommittee. We have been using the word "revitalization". We are going to revitalize the Subcommittee and we are going to become very identified with rural economic development. We want to champion that. I very much appreciate your taking the time to be with us.

We will start out with Mr. Kroese.

STATEMENT OF RON KROESE, EXECUTIVE DIRECTOR, LAND STEWARDSHIP PROJECT, MARINE ON ST. CROIX, MINNESOTA

Mr. KROESE. Thank you very much for the opportunity to testify today.

My job is to set the stage and talk about some of the concepts and fundamentals of sustainable agriculture and how it touches on rural community revitalization. Other members of the panel will go into more detail about policy matters.

My remarks come out of my work over the last 12 years in Minnesota with the Land Stewardship Project and with farmers. Farmers have really been setting the agenda for our work, and we take this grassroots approach from a book by Robert Chambers called Farmer First. That is, most of the best things that need to be done

in agriculture are already being done by many farmers, and we need to learn and honor what they have to offer and try to transfer that information and knowledge throughout agriculture.

I do want to say that I would be remiss, however, not to acknowledge the terrible situation in the Midwest with the floods. The flooding affects everybody whether they are in what we would call the sustainable agriculture camp or farming conventionally. This year out in Minnesota, Iowa and Wisconsin, it really does not make much difference how you farm when your farm is under water. People are really hurting.

I hope that the Senate will do whatever it can to help people survive this. An issue critical to sustainable agriculture is that we have been losing farmers for the last 5 or 6 decades at a rate that is going to mean we are not going to be able to achieve sustainability. The floods are very likely to drive more people out economically, unless something is done about it. That is just an overwhelming concern.

It is hard to even get farmers to our field days and other events this summer because people are distraught. They cannot relate to farming sustainably because they do not even have crops to deal with, let alone weed control problems, for example. So, it is a very serious situation.

I also hope that there will be some mechanism developed to look at some of the issues involving the way we farm and how that may have contributed to the situation or made it worse. I think flood problems would have been bad no matter what, but we need to look at what the impact has been of all the drainage and the loss of wetlands, and the increase of row crops in the upper Midwest. Then we need programs to deal with it. The ecological implications of the CRP needs to be included in the examination.

I want to respond to Senator Burns' earlier remark regarding the CRP. I think it is safe to say that the sustainable agriculture community looks at the CRP as a necessary healing strategy that was put on the land to try to deal with the fact that a lot of land was put into crop production that should have stayed in grassland. Really the role of policymakers and all of us working together is to figure out how much of that land should stay in reserve and how much can come out and be used in a sustainable fashion without environmental damage.

I also want to emphasize a point that I deal with in more detail in my written testimony about sustainable agriculture and sustainable development. I think it is fair to say that in the rest of the world sustainable agriculture is seen as the cornerstone for sustainable development. We have a special situation in our country where we are coming from the luxurious position of trying to impose sustainability on a successful production system. In much of the rest of the world, people are looking at sustainable agriculture from a different way. In other words, they are just trying to get enough food to eat, and they see sustainable methods as the only viable way to go to only get enough food, and to carry out vital rural development.

I think that they understand that solar-based agriculture, that is, living as much as possible in the present moment regarding

energy, is what sustainable agriculture is all about. In that way, agriculture can be fundamental to healthy rural development.

I also want to note that in my more cynical moments I think it is questionable whether we are going to achieve sustainable agriculture in this country no matter what we do as long as we have cheap oil, or at least the illusion of cheap oil. It has allowed us to cheat on the environment, on transportation. A lot of things we are not doing right from a sustainable perspective are being done because we can get by with it because of cheap fossil fuels. An important part of sustainable agriculture amounts to trying to figure out how we are going to move out of this situation because it is not going to stay that way forever.

We see sustainable agriculture as both a goal and a process. That is why it is so difficult to define. But as George Bird said, it really has grown in recent years from being a cause a decade or so ago into a movement that really affects farmers across the spectrum. I think most farmers are trying to move in a more sustainable direction. That is reflected in the statistics on chemical use and fertilizer use, for example. When most people think of sustainable agriculture, what quickly comes to mind is reducing chemicals and improving conservation.

But as my testimony details, there is much more to it than that. An important part of sustainable agriculture—a crucial part from our perspective—deals with issues of fairness, equity, and social justice that have to be addressed if we are going to achieve sustainability. These include issues of fairness, as George mentioned, quality of life, health of families, issues about farm workers, appropriate compensation for work on farms, issues of scale. Who shall own the land? One major problem is that more and more land is being farmed by people who do not own it. Is that a sustainable situation? And concerns about the humane treatment of animals. These issues all have a bearing on the economic success of agriculture.

For example, it is difficult to imagine how the U.S. will achieve an environmentally sound food production system if the trend toward bigger and fewer farms continues. By their very nature sustainable farming approaches are generally more management intensive and often more labor intensive than conventional methods. So, for many producers time is actually a limiting factor in utilizing sustainable methods and practices. As one would suspect, there is increasing evidence that farmers who meet the criteria for sustainability in their practices tend to be smaller than conventional operators.

Yet, despite this growing evidence that farm size does affect a farmer's capacity to farm sustainably, most farmers around the country are needing to farm more and more land, or take on more livestock, in order to make ends meet. In my own work with farmers who are striving for sustainability, I have heard many of them say that they really could not get any bigger without compromising good stewardship. They simply would not have enough time to do things as well as they would like if they had more land to farm.

Regrettably, some also admit that they are actually farming bigger than they would like in order to make a living or that they are farming with largely organic and more time consuming methods on land they own, but using quicker, less sustainable methods

on land they rent. They are not doing this because they like to. They are doing it because they have to do it to make ends meet.

I think this is the tragedy of contemporary public policy that many farmers are compromising their own values and understanding of stewardship in order to make things meet economically. In my opinion what our country and our countryside needs are more farm families on the land, not fewer. Rural economic development strategies should be formed around the understanding that we need more farmers on the land.

So, this gets to the final point I want to emphasize about economics. This is where the Small Business Committee's work can come in. Increasingly around the country, farmers are demonstrating a willingness to commit themselves to the hard work and monetary investment necessary to making the switch to sustainable farming methods. Too often, however, they are hampered by a lack of processing facilities and markets for the goods they produce. At the same time, they are most likely giving up Federal farm program benefits in order to move their farms in a more environmentally sound direction.

For example, in the Midwest, moving out of mono-cropping corn into a crop rotation system utilizing soil-building legumes and small grains means sacrificing much of one's corn base. To say the least, this is a big risk. It is bigger I believe than is fair to ask unless producers have some assurance that there will at least be markets that offer a fair return for their labor and their investment.

What I want to conclude with is the challenge that translating the values that guide stewardship based farmers into public policies that will reinforce those values and reward those farmers who put them into practice should be the basis for Federal policy. The people who follow me on the panel will go into more detail on some of the specifics in the areas we think need to be funded and new policy initiatives to further sustainable agriculture and sustainable development in the U.S.

[The prepared statement of Mr. Kroese follows:]

PREPARED STATEMENT OF RON KROESE

I am Ron Kroese, Executive Director of the Land Stewardship Project (LSP), a non-profit educational organization, headquartered in Marine on St. Croix, MN. Founded in 1982, the project works in the Upper Midwest to foster the broad adoption of an ethic of stewardship toward farmland and to promote and develop sustainable approaches to food production. Thank you very much for the opportunity to testify today on behalf of the constituents of LSP on the topic of the contribution of sustainable agriculture to rural economic development.

"Sustainable agriculture" has many definitions and interpretations. This is not surprising since the term comprises both a goal—achieving a system of food and fiber production that can be sustained indefinitely—and the means or processes to achieve that goal. Although there is much more to it, sustainable agriculture is commonly understood as a variety of alternative farming approaches that reduce or eliminate the use of petrochemical fertilizers and pesticides while conserving soil and water. For the sake of my testimony the term encompasses a range of environmentally based farming approaches from low-chemical input practices and integrated pest management strategies to biologically based organic methods that utilize no synthetic inputs.

Over the past decade, as the negative environmental and economic impacts of chemically dependent conventional agriculture have become increasingly clear, sustainable agriculture has grown from a cause championed by a few to a movement affecting the operations of most farmers and growers in the country. And indeed, in

the rest of the world sustainable agriculture is viewed as the cornerstone of what has become known as sustainable development, since a safe and dependable system of food production is understood as fundamental to social and economic security. It is my hope that this Committee also sees a sound agricultural system as the cornerstone in building a sustainable economy in this country and as fundamental to generating economic development in rural America.

Obviously, there is more to sustainable agriculture than concerns about environmental quality. Increasingly, as the debate around sustainability in agriculture has deepened beyond simply changes in farming practices, it has embraced broader social issues concerning fairness and social responsibility. These concerns, all of which are directly affected by government policies, include issues of farm size and the number of farms, the physical and mental health of farm families and farm workers, the impact of farming on the viability of rural communities and towns, the opportunities for young people to get started in farming, and the humane treatment of animals. Since they extend beyond agriculture and into ethics and values of the culture as a whole, these issues are even more difficult to address than environmental concerns. Nonetheless, they are inextricably linked to concerns about environmental stewardship and must be addressed if the U.S. is to achieve a sustainable food production system.

For example, it is difficult to imagine how the U.S. will achieve environmentally sound food production if the trend toward bigger and fewer farms continues. By their very nature, sustainable farming approaches are generally more management intensive and are often more labor intensive than conventional methods. For many producers, time is the limiting factor in utilizing sustainable methods and practices. And, as one would expect, there is a growing body of research which shows that farmers practicing sustainable farming approaches tend to have smaller farms than conventional operators. (See addendum.)

Yet, despite the growing evidence that farm size does affect a farmer's capacity to farm sustainably, most farmers around the country are needing to farm more and more land, or take on more livestock, in order to make ends meet. In my own work with farmers who are striving for sustainability, I have heard many say that they couldn't get any bigger without compromising good stewardship. There simply wouldn't be enough time to do things as well as they would like if they had more land to farm. Regrettably, some also admit they are farming bigger than they'd like to in order to make a living. Or that they are farming with largely organic, more time-consuming methods on the land they own, but are using quicker methods they consider less environmentally sound on the land they rent, again because they have to farm bigger than they would like in order to make enough money to stay in farming. This is one of the tragedies of contemporary American agriculture and one of the great failures of contemporary public policy—that many farmers are compromising their own values of stewardship in order to make it economically. What our country, and country-side, needs are more farm families on the land, not fewer, and rural economic development strategies should be formed around that understanding.

This gets to the final issue I want to emphasize regarding the components of sustainable agriculture. Namely, that farmers using environmentally sound and socially responsible approaches must be able to earn a good living from their good work. It is in this area of economic viability, as the presenters who follow me will detail, that the work of your Committee is crucial. Increasingly farmers around the country are demonstrating a willingness to commit themselves to the hard work and monetary investment necessary to making the switch to sustainable farming methods. Too often, however, they are hampered by a lack of processing facilities and markets for the goods they produce. At the same time, they are most likely giving up federal farm program benefits in order to move their farming operations in an environmentally sound direction. For example, in the Midwest, moving out of monocropping corn to a crop-rotation system utilizing soil-building legumes and small grains means sacrificing much of the farm's corn base. To say the least, this is a big risk—bigger, I believe, than is fair to ask, unless producers can have some assurance that there will be markets that offer a fair return for their labor and investment.

As is obvious by now, the perspective the Land Stewardship Project brings to this Committee is that the movement toward sustainability in agriculture represents a profound shift from the values that have driven agriculture since World War II. Success in this new paradigm of sustainability is measured in terms of health rather than growth—health of the land, health of the family, health of the community. Optimal production within the recognized constraints of the ecosystem is valued over maximum production. Technological advances are not automatically

equated with progress, nor is the wisdom from the past automatically considered passe. Neighborliness and a reasonable livelihood are treasured above the acquisition of wealth and power. To paraphrase Kentucky farmer and author Wendell Berry, a good farmer would rather have a neighbor than his neighbor's land.

To farmers committed to the path of sustainability, the soil itself is seen not merely as a physical medium that holds up plants and soaks up nutrients, but as a living biotic system that must be carefully nurtured and maintained. Animal manure is viewed not as a waste product but as a valuable resource, vital to the health and fertility of the soil. Wild places (wetlands, woodlots, windbreaks) and wildlife on the farm or ranch are appreciated as an indication of the diversity and ecological vitality of the farm. These farmers seek a balance between imposing their goals for production on the landscape and accepting the limitations imposed on them by the needs of the natural community which also depends on the land. As pioneering conservationist Aldo Leopold wrote in "Sand County Almanac": "When we see land as a community to which we belong, we may begin to use it with love and respect."

Translating the values that guide farmers committed to sustainable farming into public policies that will reinforce those values and reward those farmers who put them into practice needs to be the goal of federal policymakers. It is also consistent, I'm please to note, with the Clinton Administration's recently announced commitment to sustainable agriculture in response to the release of the National Academy of Sciences' report on pesticides and food safety. The commitment demonstrated by Congress in the 1985 and 1990 Farm Bills in linking farm program benefits to stewardship practices and in authorizing programs that begin to move USDA research in a direction more in line with the goals of sustainability are encouraging, although funding for programs directly benefiting sustainable agriculture has been woefully low. In this regard, as subsequent presenters will detail, Congress has some immediate opportunities, even within its budget restraints, to strengthen the movement toward sustainable agriculture.

Briefly, we urge Congress to:

Reform the payment limitation and eligibility rules and, wherever possible, target farm program benefits to small- and medium-size producers who are demonstrating a commitment to conservation and sustainable practices. In particular, strengthen implementation and improve the Integrated Farm Management Program, which has the potential to help many farmers diversify into beneficial crop rotations and reduce reliance to petrochemical inputs, while at the same time saving taxpayer dollars.

Increase funding for sustainable agriculture in next year's budget, particularly in the area of research and education. The Sustainable Agriculture Research and Education (SARE, formerly LISA) program has been doing a tremendous job of stimulating research and demonstration of sustainable farming throughout the country despite a minuscule budget. Yet thousands of worthy proposals for research have been turned down by the regional administrative councils for lack of funds. Also deserving full funding is the Sustainable Agriculture Technology Development and Transfer Program (SATDTP), which is authorized to train extension and other government personnel in sustainable agriculture approaches and technologies, and ATTRA (Appropriate Technology Transfer for Rural Areas) which provides sustainable farming information to producers and educators around the country via telephone and mail. Groups like the Land Stewardship Project, that work directly with farmers in the development and transfer of practical information on sustainable farming, are unable to meet the growing demand from producers for information. It is vital to have extension and government conservation personnel trained and empowered to help farmers make the transition to alternative practices.

Increase the commitment of the Small Business Administration to helping farmers and rural communities develop markets for sustainably produced food and appropriate-scale processing facilities for sustainably produced farm commodities. This would include support for the developing and marketing of new uses for crops that are good for the land and would encourage crop rotation, such as alfalfa and medic.

Again, thank you for this opportunity to testify.

ADDENDUM

To inform the debate on the Nation's agricultural systems, the Northwest Area Foundation, headquartered in St. Paul, MN, initiated a major research effort to gather and disseminate critical information about the social, economic and environ-

mental implications of conventional and sustainable agricultural systems for farms, farm families, and rural communities, and on the potential of sustainable agriculture to stabilize and revitalize rural America. The 3-year program comprised 13 research projects conducted cooperatively by land grant universities and sustainable agriculture groups in the north central and northwest states of the Foundation's region—Iowa, Minnesota, North Dakota, Montana and Oregon.

A central component of the initiative was a series of surveys of farmers to collect and analyze baseline data on current farming practices and evidence of change in the five state region. The surveys were analyzed to determine whether farmers who practice sustainable agriculture are substantially different from conventional farmers in terms of their farm operations, their family characteristics, and their economic impact on local communities.

A report on the preliminary analysis, based on survey information from farmers for the years 1989 and 1990, was released in May 1992 by Northwest Area Foundation, titled "Which Row to Hoe? A Regional Perspectives on Alternative Directions in Commercial Agriculture." (A comprehensive report on the original surveys and follow-up research will be published in 1994.)

Among the preliminary analysis' most significant findings were:

In most agricultural settings, sustainable farmers tend to own, rent, and operate fewer acres than conventional farmers.

Sustainable operations retain considerably more of their gross income than conventional operations. Conventional farms average high gross incomes but comparable or lower net incomes than sustainable farms when measured on a per-acre basis.

Sustainable farms produce a greater mix of cash crops and devote substantially more acreage to crops other than major, government-subsidized commodities than other farmers. Conventional farmers devote much more acreage to major commodity crops.

Sustainable operations appear to require more labor per acre than conventional operations.

Sustainable farms tend to be family operations and rely less on hired labor. Sustainable farmers report greater expectation that their children will continue to farm.

Sustainable and conventional farmers hold sharply divergent opinions about agriculture's contribution to environmental problems. Sustainable farmers as well as "transitional" farmers (defined as those practicing some sustainable techniques) state more often than conventional farmers that environmental and health concerns are factors in their farming decisions.

Transitional farmers report the greatest degree of economic stress and may be motivated by economic concerns at least as much as environmental concerns in their decisions to practice sustainable agriculture.

Sustainable farmers participate in the social and religious organizations of their local communities to a greater extent than other farmers, but they participate in local economies to a lesser extent. This situation is most likely explained by the fact that currently, in many cases, the information, machinery and inputs sustainable farmers need are not available from the local elevator or coop. Nor are local marketing outlets equipped to handle these farmers' products, such as organic grains. So, these producers are forced to ship to facilities beyond their local communities. It is likely that widespread conversion to sustainable agriculture would be accompanied by changing patterns of demand for materials and services that would require changes in the structure of local and regional businesses. We hope the Committee will do what it can to stimulate the development of local businesses that can provide the services and markets needed by sustainable producers.

Senator WELLSTONE. Thank you very much, Mr. Kroese. First of all, to each of you, it is impossible, since this is your life's work, to stay within a 7-minute limit and I apologize for that as well, although we will have plenty of time for questions and discussion. Your complete testimony will not only be a part of the record, but we will carefully go over it. I certainly quite agree with the import of what you are saying.

I did want to very briefly respond. I appreciate your mentioning what is happening in the Midwest right now as we speak because the only good news that I can think of is that as I have come back

here and talked to people, it does not matter whether they are Republican or Democrat. I have found that people fully understand that and I expect to see a tremendous amount of work, intense work, being done to try to get as much relief as possible to farmers.

I know when I have been out in southwest Minnesota, I have been really careful not to over-promise because the best would be 40 cents to the dollar, but we have to try to come through. Then in the medium run and longer run, I think more of you are going to have something to say about price and whatnot.

Dr. Taylor, thank you for being here.

STATEMENT OF DR. DONALD C. TAYLOR, PROFESSOR OF AGRICULTURAL ECONOMICS, SOUTH DAKOTA STATE UNIVERSITY, BROOKINGS, SD

Dr. TAYLOR. Thank you, Senator Wellstone, for the invitation to present testimony at today's hearing. In addition to my written testimony, I have two items that I am submitting for the record.

I want to begin by summarizing the conclusions from research undertaken at South Dakota State University (SDSU), concerning the interest of the committee at today's hearing. I will then provide a flavor of how we arrived at these conclusions and say something to try to help interpret the conclusions.

During the past 9 years, SDSU has conducted research comparing sustainable and conventional agricultural systems in South Dakota. Our four primary conclusions relative to today's hearing follow.

One, sustainable systems are less costly, thereby implying less potential for farmer financial crises that can undermine rural economic vitality.

Two, the yields and farmer profits generated by sustainable systems can be, but are not necessarily, comparable with those from conventional systems.

Three, the social efficiency of resource use with sustainable systems may be superior to that of conventional systems.

Four, while the short-term impacts of sustainable agricultural systems on rural economic vitality may be negative, the longer-term impacts may become positive.

In broad conceptual terms, a production system can be considered to be sustainable if it has long-term staying power ecologically, environmentally, institutionally, socially, and economically.

Applied to agriculture, farmers who select sustainable technologies choose production practices intended to be not only productive and profitable, but also benign to environment and human health. Such technologies involve the substitution of management and other on-farm produced natural resources for purchased, synthetic chemical inputs in the form of fertilizers and agricultural chemicals. Producers who substitute natural on-farm produced resources for all synthetic chemicals used in production are termed "organic." Those who use typical amounts of synthetic chemicals, on the other hand, can be considered as "mainstream" or "conventional."

My testimony today is based on results from four research projects. The research has involved both controlled experiment sta-

tion trials of two farming systems and documentation of experience by 32 commercial working sustainable farms in South Dakota. The farms are located throughout the State with most having both crops and livestock. None have commercially produced fruits or vegetables or other high-value specialty crops.

As you interpret this research-based testimony, I want to caution you of difficulties that researchers experience in trying to accurately unravel the complexities in agricultural production systems. To understand such systems, some emphasis has to be given to holistic research approaches which are especially difficult and time consuming to conduct. Resources have permitted SDSU to undertake only a modest research program on sustainable agriculture over the past 10 years. Thus, the results which underlie this testimony must be interpreted as being indicative, not as representing the final word.

Costs of production. Our research shows that the direct cash, operating production costs per acre other than for labor are consistently lower on sustainable than conventional farms. They are lower by roughly 10 to 50 percent depending on the intensity of fertilizer and agricultural chemical use and the crop mix on individual farms.

What can we conclude relative to sustainable agriculture and rural economic development from this finding? The fact that direct costs of production on sustainable farms are less than on conventional farms implies that, other things being the same, sustainable farmers are less vulnerable to defaulting on debt obligations. Therefore, they have greater long-term economic staying power, thereby contributing to rural economic vitality.

Farm production and profits. In the experiment station study, sustainable yields were sometimes less than conventional yields. In other cases, however, particularly during years of unfavorable weather, sustainable yields became comparable with and in some cases even exceeded conventional yields.

In the same study, the average net income per acre over all costs except management—what we will call per acre profit—for the organic rotation in one farming system was 60 percent more than for the conventional rotation, whereas for the other system, per acre profit was 8 percent less. In the case study comparisons of working farms, per acre profits from sustainable crop production were 8 to 27 percent less than for conventional production in four of five instances.

What can we conclude relative to sustainable agriculture and rural economic development from these findings? From the standpoint of farm production, sustainable yields may or may not be less than from conventional production. In years of adverse weather, however, sustainable systems can be expected to be more resilient than conventional systems.

From the standpoint of profitability, a majority of the research findings show sustainable systems under recent public policies and input/output prices to not be fully competitive with conventional systems.

In interpreting these findings, however, we should bear in mind three points. First, current public policies favor conventional, grain-based farming systems over more diversified crop-livestock

sustainable farming systems. Second, when the price of nonrenewable energy resources increases in the future, as it certainly will, some of the current comparative advantage of conventional agriculture will certainly erode away. Third, if the extreme imbalance in allocation of funds to support research on conventional versus sustainable agriculture were to become corrected, the likelihood of breakthroughs in understanding complex sustainable agricultural systems would increase. Developments such as these will likely enhance the relative possibilities for sustainable versus conventional technologies and farming systems.

Social efficiency of resource use. Some of the costs and benefits to society of alternative production technologies do not accrue to private entrepreneurs such as farmers and agribusinesses. To partially take account of this fact in the experiment station study, we determined that the per acre energy required for the organic rotations was less than one-third of that for the conventional rotations.

Thus, this research result suggests more favorable prospects for socially efficient utilization of local community resources and imported fossil fuel energy with sustainable compared to conventional farming systems.

Impacts of sustainable agriculture on rural economic vitality. To explore the impacts of sustainable agriculture on rural development, we determined the short-run economic effects of hypothetical conversions from conventional to sustainable farming systems in five areas of the State. Both direct and indirect or multiplier effects on personal income were estimated. The latter involved backward-linked businesses to the farm input sector in the local community and forward-linked businesses to the farm output sector.

In four of the five study areas, overall personal income effects from conventional to sustainable farm conversions were negative, whereas in one they were positive.

In interpreting these findings, we should remember that these results are based on only a short-run static analysis of the hypothesized farm conversions. If in fact such conventional to sustainable farm conversions took place over time, certain longer-term structural adjustments would almost assuredly accompany the conversions. Examples of such possible structural adjustments are technological and institutional improvements in sustainable farming systems, possible changes in the structure of agriculture with a likely movement toward smaller-scale, more genuinely family oriented farms; and replacement of reduced fertilizer and agricultural chemical business with expanded and modified information, farm machinery, and marketing services.

My own judgment is that if sustainable agriculture would become practiced on a widespread basis, there would likely in balance be overall long-term positive impacts to rural economies. However, without major changes in policy, particularly in regard to production and environmental incentives to farmers and ranchers and enhanced funding of research on sustainable agriculture, I am doubtful that within the foreseeable future there will be a significant movement toward widespread sustainable grain and livestock farming.

Thank you, Senator.

[The prepared statement of Dr. Taylor follows:]

CURRENT STATUS AND FUTURE PROSPECTS FOR SUSTAINABLE AGRICULTURE IN SOUTH DAKOTA

Testimony prepared for a hearing on "Rural Economy and Family Farming"

U.S. Senate Small Business Subcommittee

July 14, 1993

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Thank you, Senators Wellstone and Pressler, for the invitation to present testimony on the current status and future prospects for sustainable agriculture in South Dakota.

Conclusions

Based on research comparing sustainable and conventional agricultural systems undertaken by natural and social scientists at South Dakota State University during the past 9 years, we conclude the following:

- * Sustainable systems are less costly, thereby implying less potential for farmer financial crises that can undermine rural economic vitality;

- * The yields and farmer profits generated by sustainable systems can be, but are not necessarily, comparable with and sometimes are even greater than those from conventional systems;

- * The "social efficiency" of resource use with sustainable systems may be superior to that of conventional systems; and

- * While the short-term impacts of sustainable agricultural systems on rural economic vitality may be negative, the longer-term impacts may become positive.

Definitions of "sustainable" and "conventional" agriculture

Much controversy surrounds the definition of "sustainable" agriculture. One reason is that no one knows for certain all the long-term implications to the economy, society, and environment of various alternative technologies and farming systems--particularly on a location-specific basis. In broad conceptual terms, however, we can consider something as being "sustainable" if it has long-term staying power ecologically/environmentally, institutionally/socially, and economically.

Applied to agriculture, farmers who select "sustainable" technologies chose production practices intended to be not only productive and profitable but also benign to environment and human health. Such technologies involve substitution of management and other "on-farm produced natural resources" for purchased, synthetic chemical inputs in the form of fertilizers and agricultural chemicals. Examples of "natural on-farm produced resources" are:

- * Crop rotations to enhance soil fertility and control weeds;
- * Crop-livestock diversification to (a) enhance soil fertility and (b) make use of land not suited for crop production, forages included in crop rotations, and crop residues;
- * Green manures and cover crops;
- * Soil erosion control measures; and
- * Modified planting dates and mechanical/biological cultural practices.

Producers who substitute natural on-farm produced resources for all synthetic chemicals in production are termed "organic." Those who use "typical" amounts of synthetic chemicals, on the other hand, can be considered to be mainstream or "conventional."

Basis for my testimony

South Dakota State University has been undertaking comparative research on sustainable and conventional agricultural systems during the past 9 years. The research, supported by the South Dakota Agricultural Experiment Station and grants from the USDA's Sustainable Agriculture Research and Education (SARE) Program and the Northwest Area Foundation, has involved close collaboration between natural and social scientists from a wide diversity of academic disciplines.

The research has been focused on (1) "controlled" experiment station research of "organic" rotations versus conventional rotations in two farming systems, one predominantly row crop-based and the other small grain-based; (2) documentation of production and profitability of five "sustainable" case study farms versus five otherwise comparable conventional farms; and (3) 27 other working sustainable farms in South Dakota. The farms are located throughout the state, with some representing western, drier, wheat growing areas and others eastern, higher rainfall, corn-soybean areas of the state. Most of the study farms have both crops and livestock; none have commercially produced fruits or vegetables or other high-value, specialty crops.

We have given attention in different studies to a variety of dimensions of productivity (e.g., yields, crop mass, energy), profitability (longer-term average, year-to-year variations), and ecology (soil nutrients, soil moisture retention, soil erosion control, weeds, diseases, insects, nematodes). Since I have been asked to focus on the possibilities for rural economic development through sustainable agriculture, I will limit myself in this testimony to only production (both private and social) and profits.

As you interpret this testimony, I want to caution you of the extreme difficulty of being able to accurately unravel, through research, the complexities inherent in agricultural production systems. To understand such systems, single component research, the bread-and-butter approach to "modern-day science," has to be supplemented with more holistic research approaches which are inherently less precise and more time-consuming to conduct. Resources have permitted SDSU to undertake only a modest research program on sustainable agriculture over the past 9 years. Thus, the research results which underlie this testimony must inevitably be interpreted as indicative, not as representing "the final word."

In addition to this written testimony, I am submitting for the record two reports: (1) "Farm, rural economy, and policy implications of sustainable agriculture in South Dakota" and (2) "Potential effects on rural economies of conversion to sustainable farming systems." The reports on which the written testimony is most directly based are listed at the end of the testimony. By noting the authors of these various reports, you will find that what I report in this testimony is importantly based on the work of several colleagues, not just myself. I publicly acknowledge with gratitude the opportunity that I have had to professionally collaborate with and enjoy the collegueship of these fellow-scientists.

Costs of production

Our research shows that the direct (cash, operating) production costs per unit of cropland, other than for labor, are consistently lower on sustainable than conventional farms. For the south central, east central, and northeast area case farms, for example, direct costs on sustainable farms are 49-57% of those on conventional farms. In the western, drier part of the state, direct costs on sustainable farms are 85-93% of those on conventional farms. In the experiment station study, direct costs for the "organic" farming systems are 63-73% of those with the conventional systems. Direct cost differences vary depending on the intensity of fertilizer and agricultural chemical use and the crop mix in different parts of the state.

For crop production on the five case comparisons, labor use is higher on the sustainable than conventional case farms in the two corn-soybean areas, with the opposite pattern for the case farms in the three wheat growing areas. The principal use of labor for crop production is in operation of machinery. The comparative labor intensity of production depends importantly on farmers' crop mixes and management of their set-aside and fallow land.

What can we conclude relative to sustainable agriculture and rural economic development from these findings? The fact that direct costs of production on "sustainable" farms are less than on conventional farms implies that, other things the same, sustainable farmers are less vulnerable to defaulting on debt obligations; therefore, they may have greater long-term economic staying power thereby contributing to rural economic vitality. On the other hand, the fact that sustainable farms are less capital-using may imply less business for local rural banks from sustainable compared to conventional farmers.

Since labor use does not vary simply with whether a farming system is sustainable or conventional, we cannot draw general conclusions about patterns of difference in the demand for labor—with associated impacts on local rural economies—between sustainable and conventional farming systems.

Farm production and profits

In the experiment station study, comparative crop yields with the "organic" versus conventional rotations varied from year-to-year and by crop. In the row crop component, for example,

- * Corn yields were lower for the "organic" than the conventional system in 5 of the 7 test years, whereas during the 1988 drought year and the 1992 cool growing season year "organic" corn yields were higher; and

- * Soybean yields were lower for the "organic" than the conventional system in 4 of 7 years, whereas during 3 years (including 1988 and 1992) "organic" soybean yields were higher.

In the small grain component,

- * Spring wheat yields were higher for the "organic" than the conventional systems in 5 of the 7 years, whereas during 1 year they were less and during another year they were equal; and

- * Soybean yields were higher for the "organic" than the conventional systems in 5 of 7 years and lower in the other 2 years.

In the experiment station study, the net income per acre (NI/A) over all costs except for management was higher for the row crop "organic" rotations during 4 of 7 years, including 1988 and 1992. On average for the 7 years, NI/A was 1.6 times as much for the "organic" as the conventional rotation. For the small grain rotation, on the other hand, NI/A for the "organic" rotation was less than that for the conventional rotation in 4 of the 7 years, equal in 1 year, and greater in 2 years. On average for the 7 years, NI/A for the "organic" rotation was 8% less than that for the conventional rotation. The coefficient of variation, reflecting year-to-year variability in NI/A, for the row crop "organic" rotation was considerably smaller than for the conventional rotation (0.45 versus 1.38); for the small grain component of the study, the coefficients of variation for NI/A were roughly comparable (1.52 and 1.50 for the "organic" and conventional rotations, respectively).

For crop production in the five case comparisons, NI/A was 23-24% lower on the sustainable than conventional farms in the two corn-soybean areas. Patterns of variation between sustainable and conventional farms in NI/A in the three wheat growing areas were more widely variant. The NI/A in one area was 27% less for the sustainable farm than the conventional farm; in another area, the difference was only 8%; in the third area, NI/A was greater for the sustainable farm.

What can we conclude relative to sustainable agriculture and rural economic development from these findings? From the standpoint of farm production, yields for some crops in some years for the sustainable systems are less than those for conventional systems. For some crops in other years, on the other hand, sustainable yields are higher. In the two years with the most unusual weather, the latter pattern tended to prevail. What these findings suggest, then, is no general pattern of sustainable yields being consistently either lower or higher than conventional

yields. In years of adverse weather, however, sustainable systems showed themselves to have an advantage over conventional systems.

From the standpoint of profitability, a majority of the research findings show sustainable systems—under recent public policies, input and output prices, and weather conditions—to not be fully competitive with conventional systems. The disadvantage for sustainable agriculture appears to be greater in the higher rainfall corn-soybean areas than in the drier wheat growing areas of the state.

In interpreting these findings, however, we should bear in mind that, even under the current farm bill, public policies in general continue to favor conventional grain-based farming systems over more diversified crop-livestock sustainable farming systems. If environmental interests continue to gain relative to traditional agricultural interests in the public policy arena, some of the current economic advantage of conventional systems may be reduced.

At some point in the future, the prices of non-renewable energy resources appear almost certain to increase. As they do, some of the current comparative advantage of conventional agriculture will erode away (see the next section). Further, if the extreme imbalance in allocation of research funds to support research on conventional versus sustainable production technologies and farming systems were to become corrected, the likelihood of breakthroughs in understanding complex sustainable agricultural systems would increase, thereby enhancing the relative possibilities for sustainable versus conventional technologies and farming systems.

Social efficiency of resource use

Because of "externalities," the costs and benefits that accrue to private entrepreneurs such as farmers and agribusinesses often differ from the full set of "costs" and "benefits" that accrue to society. In an attempt to quantify some of the externalities in the experiment station study, attention was devoted to determining comparative energy use and crop mass production for the "organic" and conventional systems. The energy (expressed as diesel fuel equivalents per acre) required for the "organic" rotations was less than one-third as much as that for conventional rotations. The crop mass removed was 57% more with the "organic" than conventional rotation under the row crop experimental component, but 28% less under the small grain experimental component. Taking into joint account energy input and crop mass output, total crop mass removed per unit of energy input was 2.4-4.9 times as much under the "organic" rotations compared to the conventional rotations for the two types of farming systems. The coefficient of variation, reflecting the percentage of year-to-year variability in crop mass production, was 0.27 for the "organic" rotations compared to 0.34-0.35 for the conventional rotations.

Since the "organic" rotations involve use of no synthetic chemicals, we can be confident that they are no less benign to environment and human health (from the standpoint of possible hazards in applying agricultural chemicals) than are conventional rotations. The extent to which the synthetic chemicals used in conventional rotations are at levels that currently, or over time, may threaten the environment and/or human health is not known, however.

What can we conclude relative to sustainable agriculture and rural economic development from these findings? From the standpoint of energy utilization, these research results show the long-term prospects for "organic" farming systems to be brighter than for conventional farming systems. From the standpoint of crop mass production per unit of energy input, the research results also show "organic" systems to be advantageous relative to conventional systems. From the standpoint of year-to-year production stability, sustainable systems have an advantage over conventional systems. In a nutshell, then, these research results seem to suggest more favorable prospects for socially efficient utilization of local community resources (and "imported" fossil fuel energy) with sustainable compared to conventional farming systems.

Impacts of sustainable agricultural systems on rural economic vitality

According to some commentators on U.S. agriculture, trends over time toward fewer more specialized, larger-scale, capital-intensive farms have contributed to the demise of rural communities. Quantity discounts from large-scale, centralized input distributors and price premiums from major grain and livestock purchasers result in successively less and less business for small-scale rural businesses. With fewer farms, come fewer farm families, fewer children, and less demand for schools and other goods and services in rural communities.

Within this context of a gradually deteriorating U.S. rural economy, does sustainable agriculture offer prospect for alleviating or exacerbating the current state of affairs? Some recent commentators have offered the opinion that, while sustainable farms tend to be less specialized and more moderate in scale than their conventional counterparts, movement toward widespread adoption of sustainable farming practices will hurt local rural economies because sustainable farmers use fewer off-farm inputs and market their products through specialized "organic" outlets serving concentrated U.S. urban and export markets. Others offer the opinion that, with sustainable agriculture, the demand for new rural businesses may expand to meet unique informational, equipment, and other special needs of sustainable agriculture.

To explore this controversial topic, attention was given to determining the short-run effects on rural communities of hypothetical conversions from conventional to sustainable farming systems in five regions of South Dakota. The following types of personal income effects were estimated:

- * On-farm effects on agricultural households, including both family and hired labor; and

- * Off-farm effects on:

- Backward-linked businesses to the farm input sector in the local community, e.g., fertilizer and machinery dealers, service trading, finance and insurance, retail trading;

- Forward-linked businesses to the farm output sector, e.g., transportation, marketing; and

- Local business which sell consumer goods.

The results of this investigation showed that the largest impacts of conventional farms being converted to sustainable farms would be the on-farm effects on the agricultural households themselves. Effects varied among regions, but on average off-farm personal income effects were 87% of on-farm personal income effects. Of the off-farm effects, backward linkages were greater than forward linkages. These findings, in part at least, reflect the low population densities of rural South Dakota and associated relatively little developed value-added rural industries in the state.

Overall personal income effects from conventional-to-sustainable farm conversions were negative in four of the five areas. This outcome arose for two reasons. The sustainable case study agricultural households were estimated to have lower personal incomes (with no attention to price premiums for "organically" produced commodities) than corresponding conventional agricultural households in four of the five regions. Second, most of the short-run off-farm personal income effects on non-agricultural households were negative. Negative off-farm effects tended to be especially high in the retail trade subsector, including agricultural chemical dealerships.

In interpreting these estimated largely negative impacts of sustainable agricultural systems on rural economic vitality, several points should be kept in mind. These results incorporate only a short-run, static analysis of the possible impacts of hypothetical conventional-to-sustainable farm conversions. If, in fact, such conversions took place over time, certain long-run structural adjustments would almost assuredly accompany the conversions. Examples of such possible structural adjustments are (1) technological and institutional improvements in sustainable farming systems, thereby enhancing sustainable agriculture's comparative profitability; (2) possible changes in the structure of agriculture, with a possible movement toward smaller scale more genuinely family-oriented farms; and (3) replacement of reduced fertilizer and agriculture chemical business with expanded information (e.g., integrated pest management, fertility management, specialty-crop management) and alternative farm machinery and marketing services.

Since such possible structural adjustments would be extremely difficult to incorporate into an analytic framework in research, we are left with intuition as perhaps the primary basis for trying to forecast the long-term impacts of sustainable agricultural systems on rural economic vitality. My own judgment is that, if sustainable agriculture would become practiced on a widespread basis, there would likely in balance be overall, long-term positive impacts to rural economies. However, without rather major changes in policy—particularly in regard to production and environmental incentives to farmers/ranchers and enhanced funding of research on sustainable agriculture—I am doubtful that within the foreseeable future (i.e., next 2-3 decades) there will be a significant movement toward widespread "organic" grain and livestock farming.

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Potential effects on rural economies of conversion to sustainable farming systems

Thomas L. Dobbs and John D. Cole

Abstract. Conversions from conventional to sustainable farming systems could affect local rural economies either positively or negatively, by several means: changes in income of agricultural households; backward linkages to input supply firms; forward linkages to transportation, processing, and marketing firms; and changes in consumer expenditures by agricultural and other households. We estimated these effects for five local rural economies in South Dakota, representing different agroclimatic and population settlement patterns. Whole-farm economic models of case study conventional and sustainable farms in each area were used to estimate differences in input purchase and marketing patterns. We found declines in on-farm personal income (returns to farm labor and management) in four of the five case comparisons under a conversion to sustainable farming systems if organic price premiums are ignored; we found increases in three of five cases if applicable organic premiums are included. In all five study areas, total off-farm personal income drops in the portions of local economies connected to farming through backward linkages. It also drops in four of the five study areas in the portions of local economies connected through forward linkages if organic premiums are ignored (all five if organic premiums are included). However, net forward linkage effects are usually much smaller than net backward linkage effects, and on-farm personal income effects are substantially greater than either backward or forward off-farm linkage effects in most cases. The total (on- and off-farm) personal income effect of converting to sustainable systems is positive in only one area without organic premiums, and in one additional area with premiums. The ratio of total to on-farm personal income effects within local economies, considering only first round effects on backward- and forward-linked firms, averages 1.2 without organic premiums, or 0.6 with them. Taking account of more complete multiplier effects, which also consider changes in consumer expenditures and changes in expenditures for supplies by backward- and forward-linked firms, the average is 1.8 without organic premiums, or 0.8 with them. With more time for changes in sustainable production techniques and in the structure of farms and the rural economy, the overall economic effects of conversions to sustainable farming are likely to be more positive than our estimates.

Keywords: sustainable agriculture, organic farming, rural economy, multiplier effects, forward linkages, backward linkages, net farm income

Introduction

Environmental and farm profitability concerns have stimulated major debate since the mid-1980s over the relative

merits of "conventional" and "sustainable" farming systems in the United States. "Conventional" farming systems can be viewed as ones whose cropping patterns, tillage practices, and chemical fertilizer and pesticide application rates are typical for the area. "Sustainable" systems (often called "alternative", "low-input/sustainable agriculture" [LISA], "low-input", or

"regenerative" systems), on the other hand, either eliminate or greatly reduce the use of chemical fertilizers and pesticides. They emphasize crop rotations, legumes, tillage practices, and cover crops to maintain soil fertility, control weeds, and prevent soil erosion. The debate has primarily been over the different farming systems' yields, farm profits, and environmental effects.

As debate and discussion continue to broaden, the role of sustainable agriculture in revitalization of rural areas is receiving increased attention. Critics often contend that converting to "sustainable" systems would harm rural economies, primarily because "sustainable" farmers would buy fewer inputs from local agricultural supply firms. Others suggest that sustainable agriculture may be a foundation on which successful rural communities of the future can be built (Hassebrook, 1990; Ikard, 1990). This could happen if sustainable farming practices increase returns to skilled labor and management, and if new rural businesses emerge to serve the specialized needs of sustainable agriculture. Many issues need to be examined to determine which farming systems best serve the combined needs of farm families, rural communities, and the environment.

We report an empirical examination of some potential short term effects on local rural economies of a conversion from conventional to sustainable farming systems and practices, including effects on agricultural households and off-farm effects felt through forward and backward linkages. Case study "conventional" and "sustainable" farms in five different agroclimatic areas of South Dakota were used to generate data for the quantitative

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analysts. Later we discuss possible longer term implications of sustainable agriculture for rural communities that are not yet quantifiable.

Lockeretz (1989) examined some off-farm effects of the type treated here. That work drew on farm management budgets that others had developed in several parts of the U.S., including South Dakota budgets that we had developed using early research results from a South Dakota State University experiment station (Dobbs et al., 1987, 1988). The research reported here draws upon farm management data subsequently developed from actual operating sustainable farms in South Dakota. Also, whereas Lockeretz's article treated only "first-round" off-farm effects, we consider both first-round and more complete multiplier effects.

Case Study of Farm Comparisons

Case study sustainable farms in this analysis are part of a broad economic and policy study of sustainable agriculture in South Dakota. Detailed crop, livestock, and related economic information on twenty-two sustainable farms in different areas of South Dakota was collected through on-farm interviews in early 1989 (Taylor et al., 1989). Whole-farm economic analyses subsequently were done for the cropping systems of twelve of these farms (Becker et al., 1990). Effects of public policies on the relative profitability of sustainable and conventional farms have been examined, using five of those twelve sustainable farms as case studies (Dobbs et al., 1991a). These five farms also are used as cases for the analysis reported in this article; they represent particular types of sustainable farming systems in different agroclimatic areas in South Dakota (Figure 1). Corn and soybeans predominate in the south-central and east-central areas. Spring wheat is the principal crop in the northeast and northwest areas, and winter wheat is the primary cash crop in the southwest area. Each of the five farms incorporates some features in its sustainable system that differ from those of the other four; for example, the east-central sustainable farm has alfalfa as part of its rotation, whereas the south-

central farm has sweet clover, although both farms are located in "corn-soybean" areas. Detailed information about the crop rotations, cultural practices, and costs and returns of these five case farms is found in Taylor et al. (1989) and Becker et al. (1990).

These five sustainable farms are compared with five conventional farms, one of which (in the east-central area) is an actual operating farm and four of which are "synthetic." Detailed longitudinal analysis of yields and economic returns on the east-central conventional and sustainable (actual operating) farms has been reported elsewhere (Dobbs et al., 1991b). For other areas of the state, we constructed hypothetical ("synthetic") conventional farms from various information sources, including the Agricultural Census, Cooperative Extension and Soil Conservation Service reports, and interviews with key informants. Details of the crop systems and cultural practices for the conventional farms are found in Cole and Dobbs (1990).

Brief descriptions of the case farms are as follows:

1. *East-central area.* The farms have approximately 700 to 800 crop acres. The conventional farm rotates corn and soybeans in a 2-year rotation, whereas the sustainable farm rotates corn, soybeans, alfalfa, and small grains (spring wheat and oats) in a 4-year rotation. Both farms have beef cattle and bogs.
2. *South-central area.* The sustainable farm has 260 crop acres and no livestock. Soybeans and spring wheat are the cash crops on the sustainable farm, and sweet clover is used as green manure on set-aside acres. The synthetic conventional farm is assumed to be of similar size and to grow primarily corn and soybeans, plus small amounts of oats and alfalfa.
3. *Northeast area.* The farms have approximately 750 to 800 crop acres. The sustainable farm has approximately one-fourth of its land each in spring wheat, alfalfa, summer fallow, and other crops (including soybeans, millet, and flax). It also has beef cattle. The synthetic conventional farm is as-

sumed to have approximately one-third of its cropland in spring wheat, one-fifth in summer fallow, a total of one-third in corn, soybeans, and barley, and a small amount in alfalfa. It is assumed to have beef cattle.

4. *Northwest area.* The sustainable farm has approximately 900 crop acres, with approximately half in summer fallow each year, most of it in green manure sweet clover and some in forage sorghum. Approximately 40 percent of the acreage is in spring wheat and oats; remaining cropland is planted to corn. This farm has a beef cow-calf operation. The synthetic conventional farm is assumed to fallow approximately half its cropland each year, but as "black" fallow, rather than the green manure cover crop fallow used on the sustainable farm. Approximately 40% of the conventional farm's cropland is assumed to be in spring wheat and barley, and a small amount in corn. Cattle are assumed to be part of the conventional farm operation.

5. *Southwest area.* The sustainable farm has approximately 2,600 crop acres, with approximately one-third each in winter wheat and summer fallow. Most of the remainder is in buckwheat and millet, with a small amount in alfalfa. This farm has a beef cow-calf operation. The synthetic conventional farm is assumed to be of similar size, and also to have approximately one-third of its cropland each in winter wheat and summer fallow. Most of the remainder is assumed to be in sorghum and oats, and some alfalfa. It is assumed to have cattle.

Permanent hay and pasture are not included in the crop acreages described for these case farms.

Brief overviews of the key features of the case farms in each area are shown in Tables 1 and 2. Grain production per 100 acres of cropland is greater on the conventional farms in all five areas (Table 1). (Cropland in Tables 1 and 2 includes farm program set-aside, fallow, and green manure, as well as harvested crops and rotated hay.) Hay production per 100 acres of cropland is higher for the sustainable farms in the east-central and northeast areas, but higher for the conventional

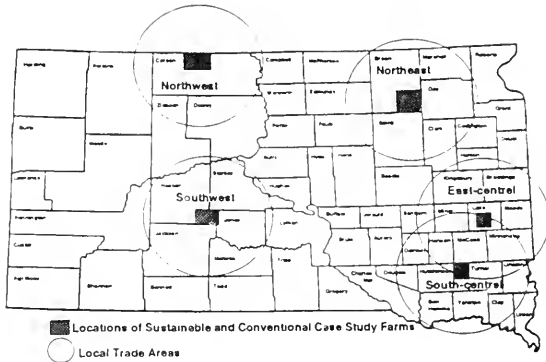


Figure 1. Locations of local trade areas and South Dakota case study farms.

farms in the south-central and southwest areas (Table 1); the south-central case sustainable farm did not have any hay. No production of hay is shown for either the sustainable or the conventional farm in the northwest area, because the alfalfa hay land there was considered more or less "permanent," that is, it is on land not included in the rest of the respective rotations. Thus, for purposes of analyzing the effects of changeovers from conventional to sustainable rotations and systems, it was not necessary to include that land in the analysis. Likewise, in all five areas, hay harvested from permanent grass or pasture was excluded.

As shown in Table 2, except in the northwest area, only the conventional case farms use commercial fertilizer. The commercial fertilizer used by the northwest case sustainable farm is an organic fertilizer of naturally mined trace minerals. The cost of commercial fertilizer per 100 acres of cropland is greater on that sustainable farm than on its conventional counterpart.

Of the case sustainable farms, only the east-central and the south-central farms use pesticides (Table 2). The east-central sustainable farm uses some herbicides on a small area. Some spring wheat is spot-sprayed with herbicides on the south-central sustainable farm.

Fuel and lubrication expenses are higher for the conventional farms than for the sustainable farms in all but the east-central area (Table 2). The differences range from 63% higher for the conventional farm in the northwest area to 30% lower for the conventional farm in the east-central area. Sustainable farms are often thought to use more tillage (primarily for weed control) and therefore more fuel. However, several factors contribute to overall fuel use per unit of cropland, including the mix of crops grown and the management of set-aside and fallow acres. In all but one case comparison, the combined result of these effects is lower fuel and lubrication expenses on sustainable than on conventional farms.

Table 1. Grain and hay production for sustainable and conventional farms, per 100 acres of cropland.

	South-central	East-central	Northeast	Northwest	Southwest
Grain (thou of bu)					
Sustainable	2,329	2,980	1,011	1,324	1,778
Conventional	5,196	5,417	2,390	1,424	2,184
Hay (tons)					
Sustainable	0	49	38	0	1
Conventional	26	36	22	0	11

Table 2. Selected expenses for sustainable and conventional farms (\$ per 100 acres of cropland).

	South-central	East-central	Northeast	Northwest	Southwest
Commercial fertilizer					
Sustainable	0	0	0	450 ¹	0
Conventional	979	1,247	786	392	335
Pesticides					
Sustainable	5	45	0	0	0
Conventional	510	1,767	589	112	70
Fuel and lubrication					
Sustainable	509	438	377	265	279
Conventional	531	306	410	433	369
Labor					
Sustainable	1,220	1,074	738	444	589
Conventional	1,225	728	821	705	619

¹Organic fertilizer

Labor expenses show a similar pattern. They are higher on the conventional farms in four of the five areas (Table 2). The differences range from 59% higher for the conventional farm in the northwest area to 32% lower in the east-central area. The principal use of labor for crop production on South Dakota farms is to operate machinery. Machine time, as reflected in part by fuel and labor use, appears to be greater on the conventional farms in most cases. All labor is included in these comparisons, whether provided by the operator, the operator's family, or hired workers. We assume that all labor, including family labor, has "opportunity cost." These comparisons, including labor expense, do not cover livestock operations of either the sustainable or the conventional farms.

Agricultural Household and First-Round Off-farm Effects

The on-farm effect of conversion from conventional to sustainable farming systems is the change in net incomes of agricultural households. Agricultural households are defined here as farm proprietors and their families and hired laborers. Off-farm effects result from "backward" and "forward" linkages to the farm sector. These linkages are conceptualized in Figure 2.

Backward linkages involve farm input purchases from retail firms (e.g., purchases

of commercial chemical fertilizers and pesticides), service firms (e.g., machinery repair purchases), and finance and insurance firms (e.g., interest payments to financial institutions). Net incomes change in the input sector because of increases or decreases in purchases; the net income changes are only a fraction of the total changes in purchases, however.

Similar net income changes occur from forward linkages when a switch to alternative farming systems causes a change in output. If output of some grains declines, for example, less grain may be stored and marketed by local elevators. We would then expect reduced profits and labor earnings by the elevators. Where hay output increases from a switch to sustainable systems, there could be additional local trucking of hay and increased profits for trucking firms.

The backward and forward linkage effects just described can be considered "first-round" off-farm effects. Later we treat additional effects on local net incomes that can result from changes in consumer purchases by agricultural households and by owners and workers in input and output sector firms.

Methods and Assumptions

Whole-farm budgets for the cropland portions of the case conventional and sustainable farms were compared to estimate first-round increases or decreases in pur-

chases (backward linkages) and sales (forward linkages) associated with conversions to sustainable farming systems. Data from various sources were used to estimate the proportions of purchases made "locally", proportions of firms' receipts that translate into personal income, and so forth (Dobbs and Cole, 1991).

Local trade areas were specified for each of the five study areas by drawing a circle with a 50-mile radius from each pair of conventional and sustainable farms (Figure 1). This distance represents approximately a 1-hour drive for goods and services, depending on the roads to particular towns. These circular local trade areas encompass approximately the following numbers of towns, many of which are very small: south-central, 100; east-central, 100; northeast, 75; northwest, 45; and southwest, 30. South Dakota's largest city, Sioux Falls, is in the trade areas of both the south-central and east-central case farms. Aberdeen, the State's third largest city, is in the northeast circular trade area. The northwest and southwest trade areas, besides having fewer towns, have none anywhere near as large as Aberdeen or Sioux Falls.

Input purchases were categorized under one of three sectors: retail trade; service trade; and finance and insurance. We estimated the proportions of each input purchased locally in each area considering natural barriers to transportation (such as rivers), towns and cities within and sur-

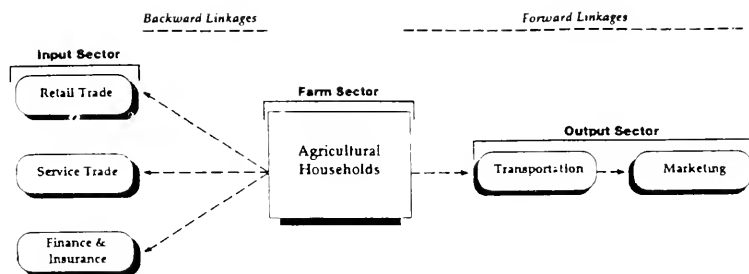


Figure 2. Conceptualization of conventional and sustainable agriculture effects on local economies.

rounding each trade area, and typical travel distances for particular kinds of goods and services. We used evidence from North Dakota and South Dakota (Dobbs, 1979; Goreham et al., 1986; Leistritz et al., 1987; Owens and Vangsness, 1973) in making our estimates for each trade area. We estimated, for example, that purchases of commercial fertilizer (a retail trade item) would be 80% local in the south-central area and 70% local in the southwest area. In the finance and insurance sector, we estimated that interest expense for operating loans would be 95% and 85% local in the south-central and southwest areas, respectively.

Similar estimates were made on the marketing (forward linkage) side. For example, in the east-central area, we estimated that 95% of the grain marketed "conventionally" is delivered to local elevators, that none of the grain presently marketed "organically" goes to local elevators or other marketing agents, and that 95% of the hay that is sold is hauled by local trucks.

Besides the proportions of input purchases and crop sales made locally, estimates were needed for proportions of receipts in each sector that constitute personal income, where personal income consists of profits, wages, and other employee compensation. Evidence from the following sources was reviewed in arriving at these estimates: Dobbs (1979), Devino et al. (1987), Leistritz et al. (1989), and U.S.

Dept. of Commerce (1977, 1989a,b,c,d). Our estimates of the proportions of receipts that constitute personal income, by sector, are: retail trade, 0.15; service trade, 0.22; finance and insurance, 0.20; agricultural households, 1.00; country elevators, 0.05; and trucking industry, 0.20. A coefficient of 0.15 for commercial fertilizer (part of the retail trade sector), means that 15% of a local agricultural supply firm's receipts from fertilizer sales was assumed to constitute profits and employee wages and other compensation.

In examining first-round effects, it is not unrealistic to use single estimates of the proportions of receipts that constitute personal income for each group of inputs (e.g., retail trade sector inputs) or outputs (e.g., grain). However, when we examine more complete multiplier effects involving subsequent rounds of expenditure, we must make distinct estimates for input types within different trade sectors and for different trade areas. That will be explained later, in the section on more complete multiplier effects.

Results

Results presented in this paper should be interpreted as case findings for different types of sustainable farming systems in rural areas of varying population densities. We have deliberately avoided presenting results here on an area (county or multi-county) basis, because it would be specula-

tive to imply that the case findings are statistically representative. Nevertheless, case findings can provide insights on the types and magnitudes (per unit of cropland) of economic effects that might result from changeovers to particular farming systems.

Table 3 shows on-farm and first-round off-farm backward and forward linkage effects on personal income from converting 100 acres from conventional to sustainable practices in each of the five South Dakota study areas. Organic premiums that four of the five case sustainable farmers received for some of their grain are excluded in the baseline analysis, but are accounted for in the figures shown in parentheses. Baseline effects range from a positive \$29 per 100 acres in the northwest area to a negative \$5,469 in the east-central area. When organic premiums are included, effects range from a positive \$361 to a negative \$5,010.

Baseline on-farm agricultural household income for the case sustainable farm in the northwest area is higher than for the comparable conventional farm, even without organic premiums (Table 3). There, the positive agricultural household effect more than offsets the negative first-round backward and forward linkage effects. When organic premiums are included, on-farm agricultural household incomes for the sustainable farms in the northeast and southwest areas also exceed those of the comparable conventional

Table 3. Summary of on-farm and first-round off-farm effects on rural economies: Changes in personal income (\$ per 100 acres).¹

	South-central	East-central	Northeast	Northwest	Southwest
Backward Linkage Effects					
Retail trade	-343	-481	273	25	-43
Service trade	-11	29	11	18	5
Finance and insurance	-62	36	-89	-29	22
Subtotal ²	417	488	-373	71	-61
On-farm Effect (Agricultural Households)					
Subtotal	-1,499	4,562	-442	116	-284
		(-4,462)	(358)	(516)	(316)
Forward Linkage Effects					
Country Elevators	-92	-424	-148	-15	16
		(-465)	(-262)	(-84)	(-37)
Trucking Industry	-10	5	6	0	-4
Subtotal ²	-102	-419	-142	-15	13
		(-461)	(-256)	(-84)	(-41)
TOTAL²	-2,018	-5,469	-957	29	-332
		(-5,010)	(-271)	(361)	(215)
Ratio of Total					
Effect to	1.35	1.20	2.17	0.25	1.17
On-farm Effect		(1.23)	(-0.76)	(0.70)	(0.68)

¹ Figures in parenthesis result when organic premiums are included in the analysis. The south-central sustainable farm has no organic sales.

² Because of rounding to whole dollars, some totals differ from the sum of the detailed numbers.

farms. In the southwest, the increased agricultural household income attributable to organic premiums more than offsets the negative off-farm effects (Table 3).

In Table 3, the forward linkage effects are more negative, or less positive, when organic premiums are included. This is because initial points of sale for organic grains currently are all outside all five local trade areas, not at local country elevators, which is where most conventional grain is delivered.

The retail trade sector is the backward-linked sector that is harmed the most by the conversion to sustainable practices in most areas. Interestingly, in two areas (the east-central and the southwest), the service trade sector experiences a slight increase in personal income because of increased machinery repair expenditures.

Net forward linkage personal income effects are relatively small (when organic

premiums are ignored) in comparison to net backward linkage effects, except in the east-central area, where the backward effects are a negative \$488 per 100 acres and the forward effects are a negative \$419 per 100 acres (Table 3). In all areas, agricultural household effects are greater than either the backward-linked or the forward-linked effects (especially in the south-central, east-central, and southwest cases) when organic premiums are ignored, and in all but the northeast area are greater than the two combined. Retail trade effects are substantially greater than other backward-linked effects in most areas, and country elevator effects substantially exceed trucking industry effects in all areas.

The ratios of total to on-farm effects in Table 3 range from 0.25 to 2.17 when organic premiums are ignored. Including the organic premiums causes the ratio for the northeast area to change from positive to

negative (from +2.17 to -0.76). This is because on-farm effects become positive, even though total effects remain negative. The ratio of total to on-farm personal income effects averages 1.23 when organic premiums are excluded and 0.64 when they are included.

More Complete Multiplier Effects

The foregoing effects cover first-round local effects on sectors linked directly to the farm sector. Additional local effects can occur from changes in consumer expenditures by farm households, in purchases of supplies by forward- and backward-linked firms, and in purchases of consumer goods by owners and employees of firms affected by first-round expenditures and subsequent rounds of expenditures. By including these effects on per-

sonal income, in addition to the agricultural household and first-round effects, more complete potential multiplier effects can be accounted for.

The approach used followed that of Darling (1990), in which economic base-type multipliers are used, similar methods are explained in more detail in Hustedde et al. (1984). We have adapted those generalized methods of assessing the effects of agriculture on local economies to the sustainable agriculture issue analyzed in this article. Our procedure, which is documented in Dobbs and Cole (1991), involves estimating on-farm and off-farm effects on personal income, where on-farm effects are defined as in the previous section. Off-farm effects include induced, indirect backward linkage, and indirect forward linkage effects.

Indirect effects are defined by Darling (1990) as follows:

$$\text{Indirect effects} = \text{OB} \times \text{PCL}_f \times \text{PSY}$$

where

OB = farmers' nonpayroll operating budgets,

PCL_f = the proportion of farmers' operating budgets spent locally, and

PSY = the proportion of consumption spending locally that becomes local income.

PCL_f values used here were the same as those used in our analysis of first-round off-farm effects (e.g., 0.70 for fertilizer purchases in the southwest area).

PSY values take into account effects on local income from all rounds of expenditure, not just the first round, to the extent that portions of each round remain within the local trade area. Estimates of PSYs for the various input and marketing sub-sectors in each of the five trade areas were made, keeping in mind values suggested by Darling (1990) and other sources of related information (Dobbs and Cole, 1991; U.S. Dept. of Commerce, 1977). Unlike when only first-round effects were examined, it was necessary here to use distinct PSY estimates for different input types within

each trade sector and for different trade areas. This is because 'leakage' from subsequent rounds of expenditure is greater for some inputs than for others within the same sector (e.g., for fertilizer, as compared to grain storage, within the retail trade sector) and for some trade areas than for others (e.g., for the southwest area, as compared to the south-central area).

As an example, we assumed a PSY value of 0.25 for the fertilizer sub-sector in southwest South Dakota. The fertilizer portion of a farmer's operating budget in southwest South Dakota decreases by \$335.15 per 100 acres on converting to the sustainable system. Using the above formula, we calculated the related backward linkage indirect change in personal income.

$$-335.15 \times 0.70 \times 0.25 = -\$58.65$$

The estimated total for all indirect backward linkage effects in the southwest area is approximately -\$98 per 100 acres.

Similar procedures were used to calculate forward linkage indirect off-farm effects. PML_f was substituted for PCL_f in the above formula, where PML_f stands for the proportion of farm product trucked or marketed by local firms. Values for PML_f were the same as those used in the analysis of first-round secondary effects. Again, using the southwest as an example, country elevator changes in receipts (positive \$378) were multiplied by the appropriate PML_f (0.85) and then times the appropriate PSY (0.06). The estimated increase in personal income from increased grain sale receipts for local elevators (and consequent increases in related input and consumer purchases) was approximately \$19 ($\$378 \times 0.85 \times 0.06$). Total indirect forward linkage effects, combining elevator and trucking industry effects, were estimated to be approximately \$14 per 100 acres in the southwest local trade area.

Agricultural households can be expected to increase (decrease) consumer spending when their personal incomes rise (fall) because of a change from conventional to sustainable systems. The changes in local area off-farm personal income that result from these increases or decreases are called induced effects. The formula for in-

duced effects is as follows (modified from Darling, 1990).

$$\text{Induced effects} = \text{AG} / (1 - \text{PCL}_h \times \text{PSY}) - \text{AG}$$

where

AG = personal income effects on agricultural households, and

PCL_h = the proportion of new household income that will be spent locally.

and PSY has the same meaning as in the first formula. Darling presents PCL_h data for Kansas counties. We used data for Kansas counties that appear similar to South Dakota areas examined in our study, and information on the number and sizes of towns and cities in and near the South Dakota local trade areas, to make judgments about appropriate PCL_h coefficients. We assumed PCL_h values of 0.85 in the south-central and east-central areas, 0.80 in the northeast area, and 0.60 in the northwest and southwest areas. Since agricultural household personal income effects (changes in labor and management income) were a negative \$283.62 in the southwest area, the calculation for induced personal income effects in that area was:

$$\begin{aligned} & -283.62 / (1 - 0.60 \times .30) - (-283.62) \\ & = -283.62 / 0.82 + 283.62 \\ & = -\$62 \end{aligned}$$

All off-farm effects (induced, indirect backward linkage, and indirect forward linkage) together are estimated to total a negative approximately \$146 per 100 acres in the southwest area, when organic premiums are ignored. Personal income in the southwest area is estimated to decline by approximately \$430 per 100 acres, when all on-farm and off-farm effects of converting 100 acres from conventional to sustainable rotations and practices are combined and when organic premiums are ignored. The ratio of estimated total to on-farm effects is 1.52.

On-farm and off-farm personal income effects for all five areas are summarized in Table 4. As with Table 3, baseline results in this table do not take account of organic premiums, whereas data in parentheses do. Total effects per 100 acres are greatest in

Table 4. Summary of on-farm and more complete multiplier off-farm effects on rural economies: Changes in personal income (\$ per 100 acres).¹

South-Central Area			
1 On-farm Effect		-1,499	
2 Off-farm Effects			
a Induced effects, agricultural households	-772		
b Indirect effects, backward linkages	-994		
c Indirect effects, forward linkages	<u>-165</u>		
Subtotal ²		<u>-1,934</u>	
TOTAL ²		-3,433	
Ratio of Total Effect to On-Farm Effect = (-3,433)/(-1,499) = 2.29			
East-Central Area			
1 On-farm Effect		-4,562	(-4,062)
2 Off-farm Effects			
a Induced effects, agricultural households	2,350		(-2,092)
b Indirect effects, backward linkages	1,177		
c Indirect effects, forward linkages	<u>-669</u>		(-735)
Subtotal ²		<u>-1,126</u>	(-4,004)
TOTAL ²		-8,757	(-8,066)
Ratio of Total Effect to On-Farm Effect = (-8,757)/(-4,562) = 1.92			
Northeast Area			
1 On-farm Effect		-442	(358)
2 Off-farm Effects			
a Induced effects, agricultural households	-172		(139)
b Indirect effects, backward linkages	-715		
c Indirect effects, forward linkages	<u>-197</u>		(-357)
Subtotal ²		<u>-1,084</u>	(-939)
TOTAL ²		-1,525	(-574)
Ratio of Total Effect to On-Farm Effect = (-1,525)/(-442) = 3.45			
Northwest Area			
1 On-farm Effect		116	(516)
2 Off-farm Effects			
a Induced effects, agricultural households	25		(113)
b Indirect effects, backward linkages	-100		
c Indirect effects, forward linkages	<u>-18</u>		(-101)
Subtotal ²		<u>-93</u>	(88)
TOTAL ²		22	(428)
Ratio of Total Effect to On-Farm Effect = 22/116 = 0.19			

(continued)

¹Figures in parenthesis result when organic premiums are included in the analysis. The south-central sustainable farm had no organic sales.

²Because of rounding to whole dollars, some totals differ from the sum of the detailed numbers.

Table 4. Summary of on-farm and more complete multiplier off-farm effects on rural economies: Changes in personal income (\$ per 100 acres).¹ (continued)

Southwest Area		
1 On-farm Effect	.284	(.316)
2 Off-farm Effects		
a Induced effects, agricultural household	-.62	(-.69)
b Indirect effects, backward linkages	.98	
c Indirect effects, forward linkages	.13	(.50)
Subtotal ²	<u>1.46</u>	(.79)
TOTAL ²	430	(238)
Ratio of Total Effect to On-Farm Effect = $(430 / .284) = 1.52$		(0.75)

¹Figures in parenthesis result when organic premiums are included in the analysis. The south-central sustainable farm had no organic sales.

²Because of rounding to whole dollars, some totals differ from the sum of the detailed numbers.

the east-central and south-central case comparisons. Net on-farm and off-farm personal income effects of conversions to sustainable farming practices are negative when organic premiums are excluded, except in the northwest, where positive on-farm effects more than offset negative off-farm effects. When organic premiums are included, the southwest case comparison also shows a positive overall effect on area personal incomes.

The ratio of total to on-farm effects ranges from 0.19 in the northwest to 3.45 in the northeast, when organic premiums are ignored. The ratio for the northeast area becomes negative (-1.60) when organic premiums are taken into account. With organic premiums, the ratio ranges from -1.60 to 2.29.

Discussion

We have reported certain quantifiable rural economy effects of conversions from conventional to sustainable rotations and practices. Effects were broken into agricultural household, backward linkage, and forward linkage effects on personal income. Effects on agricultural household personal income (consisting of labor charges and net income to management) generally were the biggest (Tables 3 and 4). This means that the principal income effect on rural economies depends upon how remunerative the sustainable practices are to farmers and farm workers, compared to conventional practices. To the extent off-farm effects on local rural economies

are important, the effects of backward linkages are usually much greater than those of forward linkages. Overall rural economy effects were negative in three of five South Dakota case farm comparisons when organic premiums were included, and in four of five when they were excluded. The ratio of total to on-farm effects is smaller when organic premiums are included because organic premiums affect on-farm incomes more than local off-farm incomes and because the off-farm forward-linked local income effects are negative.

The possible effects on rural economies of farms converting to sustainable agricultural practices that have been estimated quantitatively and presented in this article are, to some extent, short-term in nature. In the longer-term, various on- and off-farm adjustments might alter the effects we have estimated, and might cause other effects.

For example, our analyses have ignored any differences in size between conventional and sustainable farms that may exist at present or in the future. Because some people believe that sustainable farms require more intensive management, one might expect sustainable farms to be smaller, on average, than conventional farms. Operators of large farms may purchase more of their inputs in volume, at discount prices, from more distant markets. They also may be more likely to truck their grain directly to large elevators or terminals outside the local trade area. Also, to the extent that net farm income is more concentrated with conventional agricul-

ture, the coefficients for induced local off-farm personal income effects could be lower than for sustainable agriculture if the concentrated income increases the consumption of luxuries obtained outside the local area. If such differences exist, some coefficients used in our analyses would need to be altered, to reflect more "leakage" from the rural economy with large conventional farms.

Livestock have been accounted for only implicitly in this article. It is often asserted that sustainable farms are more likely to have livestock than conventional farms because sustainable farmers want manure to meet part of their soil fertility needs and because they frequently use forage legumes in their crop rotations. If livestock are present, this provides potential for greater agricultural household income, but it also has the potential for greater losses. In analyses we have conducted of nine sustainable farms in South Dakota having both crop and livestock enterprises, hogs were positive contributors to net farm income and beef cattle were negative contributors when baseline livestock prices (prices "expected" for 1988) were used (Taylor et al., 1990). The contribution of livestock to on-farm income varies with market prices, of course, and we have conducted sensitivity analyses to account for that. Livestock enterprises also have backward and forward linkage effects on local personal income. Comparison of the contributions of livestock on both sustainable and conventional farms to on- and off-farm

personal incomes was beyond the scope of the present study, however.

We can speculate briefly here on some possible implications of including livestock in a rural economy analysis. In rural areas with weak backward and forward linkages, as in much of the northern Great Plains, the principal local income effect of including livestock is likely to be the on-farm effect. That is what we found in our crop analysis. Hence, if a sustainable crop-livestock system replaces a conventional crops-only system or a conventional crop-livestock system, and if the on-farm personal income effect is substantially positive, then the total personal income effect also is likely to be positive.

The presence of livestock and associated manure can reduce the need for some purchased fertilizer. Livestock do create added demands for some off-farm inputs, such as feed additives and veterinary services. However, sustainable farmers are likely to use fewer such purchased inputs per head of livestock than conventional livestock producers. To the extent livestock go through local auction markets and, possibly, through local packing plants, crop-livestock systems are likely to exhibit greater positive forward-linked personal income effects than crops-only systems. The net forward-linked effect depends on the comparative local value added through livestock and grain, respectively, since crops-only systems tend to produce more grain than do comparably sized crop-livestock systems. If conventional crop-livestock systems are replaced by sustainable crop-livestock systems in which sustainable producers depend on organic or other special-label livestock product markets, forward-linked local personal income effects are likely to be negative unless a specialized local processor-marketer is involved.

As research on "sustainable" agriculture intensifies over the next few years, the relative economic profitability of sustainable systems is likely to increase. Changes in Federal farm programs and energy prices are also likely to increase the relative profitability of sustainable farming sys-

tems (Dobbs et al., 1991a,b). Although organic premiums could substantially decline if large numbers of producers enter organic markets, a shift toward sustainable farming practices could cause grain prices to rise overall, because less cropland would be in grain, and per acre yields of some crops, such as corn, could be lower. (Conversely, forage prices could fall.) These and other factors are likely to change the mix of available "sustainable" practices and to change the relative profitability of sustainable and conventional practices. Both on-farm incomes and induced off-farm incomes would be affected by those changes. Rural economy effects of conversions from conventional to sustainable agricultural practices are likely to appear more positive (or less negative) than in the short-term analysis of this article.

In a longer term and more dynamic context, other rural economy changes are likely to accompany conversions to sustainable agriculture practices. Some agricultural input suppliers may provide more information services, such as integrated pest management, fertility management, and specialty crop management, not just physical products such as chemical fertilizers and pesticides. Thus, as demands for some types of conventional agricultural inputs decline, demands for other, less conventional inputs may increase. Likewise, as farmers diversify into other crops as they adopt sustainable rotations, the demand for new and different types of local marketing facilities, machinery, and services is likely to expand.

It is difficult to identify precisely all the changes that might occur in rural economies if we move to more sustainable farming practices over the next few decades, and it is even harder to quantify these changes. It is important to quantify the short-term changes analyzed in this article, to understand the adjustments in the rural economy that may be involved in a transition to sustainable agriculture practices. However, we must keep in mind that other changes would probably occur too, many of which may be beneficial to rural economies.

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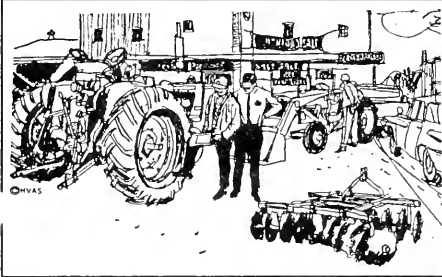
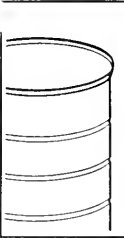
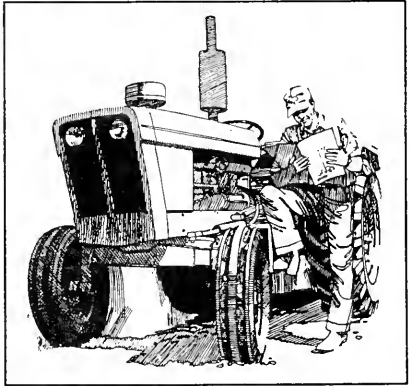
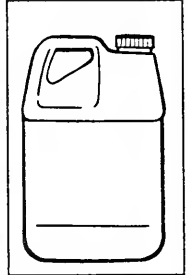
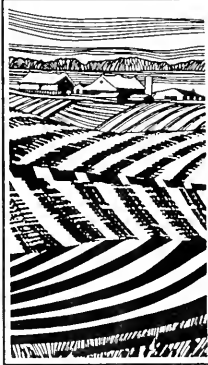
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B 713
May 1992

FARM, RURAL ECONOMY,
AND POLICY IMPLICATIONS
OF
**SUSTAINABLE
AGRICULTURE**
— IN SOUTH DAKOTA —

AGRICULTURAL EXPERIMENT STATION
SOUTH DAKOTA STATE UNIVERSITY
U.S. DEPARTMENT OF AGRICULTURE



Preface

This bulletin is a summary report of an intensive 4-year study of "sustainable agriculture" in South Dakota. Surveys and case studies gave us an understanding of agro-economic and economic contrasts between "conventional" and "sustainable" farming systems in different agro-climatic areas of South Dakota.

Special attention was devoted to the effects of alternative farm and environmental policies on the relative profitabilities of different farming systems. Also, the implications of different systems for the economic strength of rural communities were examined.

More detailed articles and reports on the various components of this study are listed in Annex A. The annex contains a brief description of each report, as well as the charges to cover reproduction and postage for readers wishing to obtain copies. Copies of the reports can be obtained by writing to:

Sustainable Agriculture
SDSU Econ Department
Box 504A
Brookings SD 57007-0895

Checks made out to the SDSU Economics Department should accompany publication orders.

Several individuals and institutions deserve our sincere appreciation for support given to this

study. The SDSU Agricultural Experiment Station and the Northwest Area Foundation (NWAFF), based in St. Paul, Minn., provided the essential monetary support for this study. Karl Stauber, vice president-program of the NWAFF, was encouraging, flexible, and supportive in numerous ways throughout the study.

We owe special appreciation to several colleagues. David Becker contributed throughout the study, starting with the on-farm interviews. He also did much of the enterprise and whole-farm budgeting for the sustainable farms, and he was deeply involved in the policy analyses. Clarence Mends was responsible for much of the economic analysis with the east-central South Dakota case farms over several years and assisted with the livestock analyses for sustainable farms. John Cole had principal responsibility for developing enterprise and whole-farm budgets for conventional farms; he also collaborated on the rural economy and energy analysis components of the study.

Former graduate students Liang Min Tong and Indrati Ranasinghe also contributed to the study. Tong through her analysis of relative risks and Ranasinghe through her examination of farm size and structure issues. Several undergraduate research assistants,

including Rod Kappes, Scott Van Der Werff, and Kellie Koehne, also contributed to particular research and education components of this project.

A special note of appreciation is due to Diane Rickerl, who has collaborated with us on other sustainable agriculture studies at SDSU and who has generously provided advice and reviews throughout this study. She, along with Bashir Qasmi, provided constructive reviews of a draft of this bulletin. We also thank Mary Brashier for her editorial support and for helping to guide this report through to publication. Verna Clark's careful and patient typing of several drafts has been greatly appreciated.

Finally, we heartily thank the farmers who cooperated in this study. They completed questionnaires, gave of their time for on-farm interviews, showed us their farming operations, and in many ways provided critical data and insights. We especially thank the Northern Plains Sustainable Agriculture Society (NPSAS), a farmer-based organization, and particularly Fred Kirschenmann, for critical cooperation and involvement in the research, workshop, and conference components of this project.

TLD, DCT, and JDS
May 1992

FARM, RURAL ECONOMY, AND POLICY IMPLICATIONS OF SUSTAINABLE AGRICULTURE

IN SOUTH DAKOTA

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SDSU

Inherent in the term "sustainable" is a long-term point of reference. Sustainable development in a state, region, or country requires private and public decisions within the context of both short-term technical and economic concerns and long-term environmental, economic, and institutional "staying power." In other words, unless decisions result in mankind surviving over the long term—able to live in an environment with (1) non-degrading natural resources, (2) adequate food and incomes to meet the basic needs of all people, and (3) human organizational/political institutions that enable people to live in harmony—an agricultural production system will not be "sustainable."

No one, of course, knows for sure today what approaches in agriculture will prove to be sustainable environmentally, economically, and institutionally over the long term. Nevertheless, research does give us some insights on the prospects for particular systems.

South Dakota State University (SDSU) has been conducting research since the mid-1980s

on what has come to be called sustainable agriculture. We have been examining farming systems in which producers adopt management-intensive, holistic system orientations in planning their farms. Such farm managers generally view themselves as allies with nature, rather than as conquerors of nature. In addition to economic survivability, these farmers tend to give high priority to (1) being good stewards of the soil, (2) reducing pollution of ground and surface water, (3) raising chemical residue-free, high quality products, and (4) reducing possible harmful effects of farm chemicals on their families' health.

In practice, such sustainable producers use crop rotations and other natural soil-building and cultural practices to at least partially replace synthetic chemicals (e.g., fertilizers, pesticides). They substitute on-farm produced resources for externally produced, purchased inputs.

There is no universally accepted dividing line between "conventional" and "sustainable" farming systems. We have termed producers to be "sus-

tainable" simply on the basis of their indicating that they make deliberate decisions to substitute the above types of management practices for synthetic chemicals, without reference to the degree to which the substitution takes place. Sustainable producers who use **no** synthetic chemicals are termed "organic."

For the purpose of this report, we term those producers who do not meet this criterion for sustainability as "conventional." We recognize the oversimplification represented by this simple, bipolar classification of farmers. Nevertheless, some classification is necessary if we are to analyze the implications of contrasting farm practices.

Sustainable Agriculture Research at SDSU

As in the rest of the U.S., sustainability issues are receiving major attention in South Dakota. In response to grass-roots initiatives from farmers, SDSU began research on sustainable agriculture in 1984. Initial work of plant scientists involved monitoring "conven-

tional" and "sustainable" farmers' fields in the east-central part of the state. Production practices, soil fertility, yields, pest populations, and other agronomic parameters were measured. Intensive monitoring has continued on one of the conventional farms and on one of the sustainable farms, and agricultural economists have joined the plant scientists in data collection and analysis.

SDSU's sustainable agriculture research was incorporated into agronomy trials at the Northeast Research Station near Watertown, starting in 1985. Long-term trials compare various combinations of crop rotations and cultural practices (conventional, reduced tillage, and alternative or sustainable). Agronomic and economic results of those trials have been and continue to be published in journal articles and other research reports.

The sustainable agriculture research program expanded in 1988 to include a broader perspective on sustainable farming practices across the state. A mail survey of known "sustainable" farmers in South Dakota was conducted that year, and 32 usable responses were returned. A grant received in late 1988 from the Northwest Area Foundation (NWAf), in St. Paul, Minn., helped fund expanded research work with farmers—first through follow-up, on-farm interviews with 22 of the sustainable farmers who responded to the mail survey.

Detailed results of those interviews, related data collection, and subsequent analyses are contained in a series of reports listed in Annex A. The reports cover crop and livestock enter-

prise practices, participation in federal farm programs, attitudes toward farm policy, profitability of sustainable farming systems in comparison to conventional systems, effects of increased energy prices and of various farm and environmental policy options on relative profitabilities of sustainable and conventional systems, and potential effects of conversions to sustainable farming systems on the economic health of rural communities. This bulletin is an overview of the NWAf-supported study.

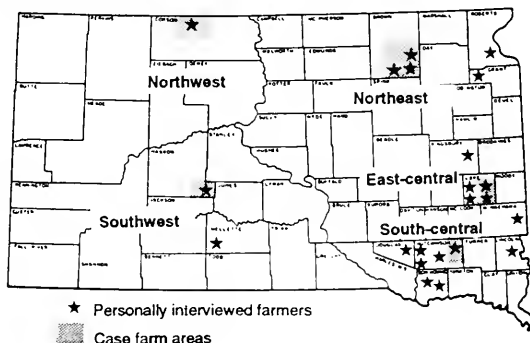
Locations of the 22 farms on which personal interviews were conducted are shown in Figure 1. Detailed economic analyses of the crop systems were conducted for 12 of the 22 farms, and economic analyses of the livestock systems also were conducted for the nine of those 12 farms which have livestock.

For purposes of **policy** and **rural economy** analyses, five of the 22 farms were used as

case studies. The five farms represent sustainable systems in different agro-climatic areas within South Dakota (shown in Figure 1): south-central, east-central, northeast, northwest, and southwest. These five "sustainable" farms are compared with five "conventional" farms, one of which (in the east-central area) is an actual operating farm and four of which are "synthetic." The east-central conventional and sustainable (actual operating) case farms are the ones noted previously for which SDSU has been collecting data since the mid-1980s.

For areas of the state in which we did not have actual operating conventional farms as "controls," a variety of information sources was used to construct hypothetical ("synthetic") conventional farms to compare with the actual sustainable farms. Agricultural census data, Cooperative Extension and Soil Conservation Service reports, and interviews with

Fig 1. Locations, by region, of the 22 personally interviewed sustainable farmers and of case farm areas.



knowledgeable individuals ("key informants") were among the information sources used.

In the final stages of the NWAf-supported study, panels of sustainable and conventional farmers, Extension agents, and other key informants were interviewed in each of the five

agro-climatic areas. Prior to the panel interviews, we identified the major apparent contrasts in crop rotations and tillage and other cultural practices between sustainable and conventional farming systems in each agro-climatic area. A questionnaire was developed, for each region, in which the

apparent contrasts were described. Respondents could agree or disagree with each stated contrasting crop management practice and could give their views on the primary constraints keeping more farmers from adopting sustainable practices.

Production Management Practices: Sustainable Farmers Compared to Conventional Farmers

Crops

These results are based on the collective results from the 32 mail survey questionnaires, the 22 personal interviews, the 12 whole-farm economic analyses, and the various panel responses.

They show four main contrasts between sustainable and conventional crop management practices. Sustainable farmers (1) follow more diversified cropping patterns than conventional farmers; (2) frequently use sweet clover and sometimes forage sudan as green manure crops on summer fallow/set-aside land, rather than leaving the land in unprotected (black) fallow; (3) substitute harvested legumes, green manures, crop residues, and livestock manure for purchased fertilizers; and (4) substitute crop rotations, mechanical tillage, and other cultural practices for chemical methods of weed control. Each management practice is briefly discussed.

Crop mixes. The greater diversity on sustainable farms broadly includes several non-program crops (a diversity of small grains, legumes, and for-

age sudan) to partially replace the row crops (corn and soybeans) and/or wheat that are the center of cropping systems on most conventional farms. These diversified cropping patterns are built around strategically designed crop rotations.

Virtually all the sustainable crop rotations studied have at least one small grain (most commonly wheat and oats, followed in order of importance by rye, millet, barley, and buckwheat). About three fourths of the rotations contain at least one row crop (soybeans or corn)¹, and about two thirds have at least one forage legume (alfalfa or sweet clover). The number of years that alfalfa is harvested, after the establishment year, ranges from 1 to 7, with 4 to 5 most common. Two east-central farmers harvest alfalfa for only 1 year. Their rationale is to realize a maximum of nitrogen fixation and weed control benefits and a minimum of soil moisture loss from alfalfa.²

Summer fallowing is a common component of southwest, northwest, and northeast crop rotations. Fallowing intensities commonly range from once per 2 years to once per 5 years, with the fallowing interval tending to be shorter in the west than in the northeast.³ About three fifths of the sustainable farmers who summer fallow plant cover crops on the fallowed land. Sweet clover is most common, followed by forage sudan.

The primary rationale for greater crop diversification on sustainable farms is the strategic role of crop rotations in enhancing soil fertility and controlling pests. Sustainable farmers believe that these benefits compensate economically, over the duration of their crop rotations, for the relatively low annual returns from many small grains and the annual

these two farmers follow alfalfa with soybeans rather than with corn.

³ Two farmers (one in the south-central region and one in the west) rest all of their owned land every 7th year, however.

¹ Row crops are almost totally limited to farms east of the Missouri River.

² Also, because soybeans are less moisture-demanding than corn,

net losses from green manure crops. In addition, wider crop diversification enables a more uniform distribution over the year of the labor demands for various enterprises. Some sustainable farmers also emphasize that the lesser per-acre labor requirement for their small grains allows them added time for attention to more demanding row crops.

A variety of factors appear to hold back more widespread crop diversification in South Dakota. Many conventional farmers question the economic viability of "low value" small grains (especially in relation to soybeans) and green manure crops, particularly with current federal farm program provisions. Additional concerns include perceived (1) less drought tolerance and less crop residues for several non-program crops than for wheat; (2) inadequate machinery inventories to undertake cultural operations for a wider array of crops; (3) difficulties in successfully establishing forage legumes; (4) price risk in selling forages; (5) inadequate facilities to store a wider array of crops; and (6) inadequately developed markets for non-program crops.⁴ Some conventional farmers also question the wisdom of trying to spread their managerial talents over too many farm enterprises.

Summer fallow/set-aside land management practices.⁵

Sustainable farmers often use

sweet clover and sometimes forage sudan as a green manure crop on summer fallow/set-aside land, rather than following the more general practice of leaving the land in unprotected fallow.⁶ This includes farmers in western South Dakota where annual growing-season precipitation averages less than 15 inches. They feel that the positive impacts on soil fertility, soil moisture retention, and weed competition of the green manure crop more than counterbalance economically the draw-down on soil moisture which results from a green manure crop on summer fallow/set-aside land.

Conventional farmers tend to be skeptical about the wisdom of planting green manure crops on summer fallow/set-aside land. They place more weight on the disadvantages of green manuring than their sustainable counterparts do. In addition to soil moisture draw-down from a growing crop on

west, and southwest regions than in either the south- or east-central regions. Farmers who participate in federal farm programs throughout the state, however, have set-aside acres.

⁶ In the northeast, however, some conventional farmers have traditionally planted strips of flax on summer fallowed land, rather than leave the land entirely black. In recent, rather droughty years, some farmers in the south- and east-central areas of the state have planted crops such as forage sorghum and millet on their set-aside land—for use as potential livestock feed if there would be a drought declaration by the USDA or for feed after the end of the 5-month ASCS haying and grazing restriction period.

idled land, they generally believe that it costs more to grow than to buy nitrogen. They are further concerned about perceived (1) additional time and cost for establishing and maintaining a cover crop vs. maintaining unprotected fallow; (2) difficulties in being able to successfully establish a green manure crop on idled land; (3) complications of having to make prior-year decisions about which fields are to be placed in set-aside, so that the cover crop can be seeded; (4) difficulties in being able to effectively kill sweet clover the year following fallow; and (5) complications in subsequent year seeding because of possible inadequate decay of cover crop residue.

Soil fertility enhancement.

Contrasting approaches to maintain and enhance soil fertility—revolving around the presence in soil of elemental nutrients, organic matter, and tilth—constitute a central point in the sustainable-conventional farming controversy.⁷

Sustainable farmers rank their most important sources of on-farm produced soil fertility in the following order: harvested legumes, green manure crops, crop residues, and livestock manure.

Conventional farmers emphasize that they are applying less

⁴ Sustainable farmers point out, however, the existence of special "organic" markets for several non-program crops.

⁵ Summer fallowing is much more common in the northeast, north-

⁷ While sustainable farmers throughout the state tend to substitute on-farm produced soil fertility sources for purchased soil fertility sources, in recent droughty years, neither sustainable nor conventional farmers west of the Missouri River have very commonly used much synthetic chemical fertilizer.

purchased fertilizer now than formerly. They stress their use of soil testing and applying "only as much fertilizer as is needed and when it is needed." They are concerned that further reductions in chemical fertilizer use will reduce yields and profits. These views are partly based on their belief that it is cheaper to obtain nutrients from synthetic than natural sources.

Additional constraints to conventional farmers substituting more on-farm sources for purchased sources to meet soil fertility needs are perceived (1) inevitable losses of soil phosphorus and potassium, no matter how much on-farm nutrient recycling takes place; (2) incapacity to produce adequate quantities of on-farm soil nutrients to meet total nutrient demands of crops; (3) difficulty in being able to satisfactorily monitor nutrient application rates from on-farm produced sources of soil nutrients; and (4) slow release of soil nitrogen following farmyard manure field applications.

Weed control.* The primary way that sustainable farmers control weeds is crop rotation.

⁸ Cultural practices for controlling weeds in addition to those discussed in this section include (1) delayed planting of row crops to allow later pre-plant tillage (in the south where growing seasons are longer), (2) planting early season crops (e.g., soybeans, sunflowers) the following year, (3) increasing plant populations to provide greater competition for weeds, (4) using only certified and/or "clean" seed, (5) selecting weed competitive crops (e.g., rye, buckwheat), (6) composting manure to destroy weed seeds, and (7) hand weeding (soybeans).

Rotations interrupt growth cycles of individual weed species. This control is achieved by alternating forage crops with row and small grain crops. It includes (1) both warm- and cool-season crops and (2) crops with different harvesting dates that together provide year-to-year variation in the growing environment for weeds.

The effectiveness of forage legumes in combating weeds arises from the competitive nature of these crops and their multiple harvests (mowing). The allelopathic effects (chemicals released by plants that suppress growth of other plants), heavy tillering (space competition), and wide leaf canopy (shading) features of crops such as rye, millet, and buckwheat are also believed to contribute to weed control.

After crop rotations, the most important means of weed control is mechanical tillage. The sustainable farmers in the study undertake an average of about four weed control operations with corn and soybeans. One weed control operation is used in about three fourths of the rotations which have spring-planted small grains.

Sustainable farmers stress the critical importance of timing in mechanical tillage. Some indicate, for example, that rotary hoeing has to be done at "exactly the right time," whereas herbicides may be selected to suit the stage of weed growth at which farmers find the time to undertake chemical weed control. They acknowledge that it is "easier" to select from a range of herbicides to control a particular weed at a particular time than it is to maintain

and select from a range of different types of tillage equipment the means of mechanical tillage likely to be most effective.

Conventional farmers stress that the economic pressures of the 1980s have forced them to become increasingly careful in monitoring the need for and limiting the use of herbicides. Two commonly emphasized approaches in limiting chemical use are combining mechanical with chemical weed control and banding herbicide applications. Many believe that, for a comparable level of weed control, the costs of owning, maintaining, and operating sprayers (including herbicide costs) are less than the costs associated with ownership and use of mechanical tillage equipment. Most also believe that their current practices are not environmentally damaging.

Other factors constraining more widespread reliance on non-chemical means of weed control include perceived (1) greater soil moisture losses (and, to a lesser extent, greater soil erosion) from mechanical control; (2) more time required—at especially critical times—to perform mechanical control; and (3) inadequate ranges of mechanical tillage equipment on farms.

Sustainable farmers acknowledge the possibility of greater soil moisture loss with mechanical tillage, but they believe that steps can be taken to at least partially overcome these possible soil moisture losses (e.g., "discing after combining to kill weeds and then chisel plowing before the soil freezes to open the soil so that the snow melt and early spring

rains will soak in"). Further, they believe that the improved soil tilth resulting from sustainable practices helps to mitigate soil moisture loss.

Perhaps even more fundamental to the sustainable vs. conventional weed control controversy are different underlying philosophies concerning the presence of weeds in farmers' fields. The essence of the contrasting philosophies is captured in the following two quotes, the first one from a conventional farmer and the second from a sustainable farmer.

We have pride in the appearance of our fields; we don't like to see weeds.
us.

Weeds are a part of the eco-system. Our goal should not be to totally eliminate them, but to bring them within tolerable limits.

Livestock

Until now in SDSU's research on sustainable agriculture, much less attention has been focused on livestock than on crop production management. This section is, therefore, briefer, and its findings are more preliminary. It is primarily based on the responses of the 18 personally interviewed sustainable farmers who had commercial (arbitrarily defined to involve five or more head) livestock enterprises.

Beef cattle are by far the most common livestock enterprise on the sustainable farms, with 67% of the studied farms having commercial herds of beef cattle and 19% having hogs

and 5% having dairy cattle. The percentage of sustainable farms with livestock is slightly greater than that for farms generally in South Dakota.⁹

The size of livestock enterprises on individual sustainable farms, however, appears to be below average, relative to farms generally in the state. For example, of the 13 sustainable farms with cow-calf enterprises in the study, the average number of cows per herd is 45, compared to the statewide average of 79. Similarly, the average sustainable cattle finishing enterprise of 26 head is far smaller than the state average of 150 head per cattle feeder.

Those producers who consider themselves to raise beef cattle sustainably follow three distinctive types of practices. They feed only "organically" grown grain and roughage to their cattle; they rely much less on grain in finishing cattle than conventional farmers do;¹⁰ and they do not use antibiotics and other additives in concentrate feeds, hormones and other growth promotants, insecticides, vaccinations, or closed confinement facilities. They generally believe that the physical and economic performance

of their cattle is comparable, or perhaps even superior, to that of cattle raised with conventional practices.

Conventional producers question those claims. They indicate that research shows cattle not receiving ionophores, growth implants, vaccinations, and antibiotics to have poorer physical performance and more fragile health.

Sustainable producers counter by saying that those research results are based on single-component research designs, in which only one management practice is varied at a time and all other practices are held the same. They believe that interactions among practices have an important impact on cattle performance and that cattle managed with their packages of practices can perform just as well as cattle managed with packages of conventional practices.

We do not know which set of views is more accurate. However, SDSU's Economics Department, in collaboration with several other departments at SDSU, has recently initiated a new 4-year research project, "Sustainability of 'organic' vs. 'conventional' beef production in South Dakota." This project is designed to compare the economic performance of similar types of cattle on farms with similar natural and economic resources and similar management levels, but in one case on selected farms following "organic" management technologies and in another on selected farms following "conventional" management technologies.

⁹ Unless otherwise noted, the data base for "farmers in general in South Dakota" is the 1987 Census of Agriculture for South Dakota.

¹⁰ For example, none of the cattle feeders in this study includes more than 40% dry grain in finishing cattle rations, whereas the average percentage of dry grain for the state's cattle feeders is 80% (D. Taylor and J. Wagner, *South Dakota Feedlot Management*, SDAES B 709, 1991).

Economic Performance of Sustainable Systems

Yields

The economic performance of sustainable farming systems in comparison to conventional systems depends on several factors, including the mix of crops in different systems, market prices, federal farm program provisions, and relative crop yields. The following judgments on comparative sustainable and conventional crop yields are those of the 22 personally interviewed sustainable farmers. The judgments are with respect to corn, soybean, oat, spring wheat, and alfalfa yields during years of unusually favorable conditions, normal conditions, and unusually unfavorable production conditions.

Under normal production conditions, some sustainable farmers believe sustainable row crop and small grain yields are greater than conventional crop yields. Larger numbers of sustainable farmers, however, believe that sustainable yields are less. During unusually favorable growing conditions, the yield advantage to conventionally raised crops is perceived to be even greater.

During years of exceptionally unfavorable production conditions, however, the yield advantage to conventionally raised crops essentially disappears. In other words, most respondents believe that yields of sustainably raised crops are little different from those for conventionally raised crops. This perception is consistent with yield comparisons generally reported in the literature. It reflects, at least in part, an improvement in soil properties

linked to rotational benefits of sustainable farming practices.

In general, yield differences between crops grown under sustainable vs. conventional farming practices are believed to be greatest for row crops (corn and soybeans), intermediate for small grains (oats and spring wheat), and least for alfalfa. This finding is understandable, because the heaviest synthetic fertilizer and pesticide use by conventional farmers is with row crops and the least use is with alfalfa. Herbicides also allow use of certain agronomically advantageous cultural practices, such as narrow-row soybeans, that increase yields.

Relative profitability of crop systems

Profitability comparisons for the case farms in each agro-climatic region are shown in Table 1. For the east-central case farms, average annual results for a 6-year (1985-1990) period are shown. Some of the crop production from the east-central sustainable farm is sold in organic markets, at varying price premiums. The effect of such premiums is explained in a table footnote.

"Typical year" (late 1980s) profitability estimates are shown in Table 1 for the case farms in the other four agro-climatic areas. In the "typical year," crop rotations, cultural practices, and federal farm program set-aside requirements represent 1988, the year for which survey data were collected in the on-farm interviews with

sustainable farmers. Crop yields are intended to reflect "normal" yields for each type of farm (not the actual yields in 1988, a drought year). Results are shown both without (w/o) and with (w) organic premiums, except for the south-central area sustainable farm which does not sell any of its crop production in organic markets. The analyses "with" include approximations of actual premiums received for those portions of crops sold in organic markets by individual farmers.

Direct costs (sometimes referred to as "operating" or as "cash" costs) are lower for the sustainable farms in all cases (Table 1). In most cases, this is due to (1) the types of crop rotations and (2) minimal or no use of chemical fertilizers and pesticides on the sustainable farms.

Differences in direct costs are quite small in the western wheat growing areas of South Dakota, however. The semi-arid climate in that part of the state induces even the more conventional farmers to go light on purchased chemical inputs. Moreover, the northwest South Dakota sustainable farmer uses an "organic" fertilizer which adds about \$9/acre to the costs of several of his crops; hence, direct costs on the northwest sustainable farm are almost as high as on the comparison conventional farm.

Gross income (including applicable government deficiency payments for program crops) on the conventional farms is higher than on the sustainable farms, especially in the south-

Table 1. Profitability of sustainable and conventional agriculture, on-farm studies, South Dakota.

	Direct costs other than labor	Gross income***	Net income after subtracting all costs except		
Land, labor, and management			Land and management	Management	
----- U.S. dollars/acre -----					
6-year (1985-1990) average comparison of east-central corn-soybean area case farms					
1. Actual sustainable farm (w/o organic premiums)*	46	167	90	78	42
2. Actual conventional farm	87	224	109	101	65
Typical-year (late 1980s) comparisons of case farms					
A. South-central corn-soybean area:					
1. Actual sustainable farm (no organic premiums)**	36	129	62	50	12
2. Typical conventional farm	63	174	77	65	27
B. Northeast spring wheat area:					
1. Actual sustainable farm					
a. w/o organic premiums	24	64	18	11	-14
b. w organic premiums	24	72	27	19	-6
2. Typical conventional farm	46	96	23	15	-11
C. Northwest spring wheat area:					
1. Actual sustainable farm					
a. w/o organic premiums	27	47	2	-2	-18
b. w organic premiums	27	50	6	1	-14
2. Typical conventional farm	29	50	1	-6	-21
D. Southwest winter wheat area:					
1. Actual sustainable farm					
a. w/o organic premiums	23	70	29	23	6
b. w organic premiums	23	76	35	29	12
2. Typical conventional farm	27	78	32	25	8

* Analysis of organic premiums for the east-central sustainable farm showed that such premiums can add several dollars/acre to the farm's net income. In one particularly good year for this farm's organic premiums, the premiums added \$17/acre (on a whole-farm basis) to net income.

** This sustainable farm did not sell any crop products in organic markets.

*** This includes applicable government deficiency payments for program crops.

central and east-central parts of the state where corn-soybean combinations have generally enjoyed a comparative advantage over other crops. Average precipitation is higher in these corn-soybean areas than in the other parts of the state.

In the northeast, where spring wheat, other small grains, and row crops are grown, the difference in gross income between the conventional and the sustainable farm is not as great. In the northwest (spring wheat) and southwest (winter wheat) areas of the state, gross income is only slightly higher on the conventional farms. Inclusion of organic premiums on the sustainable farms closes the gross income gap completely in the northwest area and nearly eliminates the gap in the southwest area.

Several measures of net farm income are presented in the last three columns of Table 1. The first measure includes a deduction for all costs (including fertilizer, herbicides, and items like machinery depreciation and interest) except for land, labor, and management. The next measure of net income differs from the first only in that costs for family and hired labor also are subtracted. In computing the final measure, a land charge (based on 1988 land market conditions and approximate property tax rates) is also deducted. The land charge is the same for the conventional and the sustainable farm within each region. "Net income after subtracting all costs except management" constitutes what is often referred to as pure profit or as return to management for planning and risk taking.

Profitability measures in the longitudinal study of two east-central South Dakota farms show the conventional farm to have been more profitable than the sustainable farm, on average, over the 1985-1990 time period. Direct costs were much lower on the sustainable farm. However, on average, gross income was enough higher on the conventional farm to cause that farm to be more profitable. The sustainable farm was more profitable in one of the years (1988), even ignoring organic premiums. Organic premiums were sufficient to make it more profitable than the conventional farm in at least one other year (1989), also.

Case studies in the other areas of South Dakota show the conventional farm to be more profitable in a "typical" year in the late 1980s than the low-input farm in the south-central corn-soybean area, but show little difference in profitability between conventional and low-input farms in the wheat growing areas. In fact, when organic premiums are included for the low-input farms in the three wheat growing areas, those farms are slightly more profitable than their conventional counterparts.

The effects of energy price increases on direct costs and relative profitabilities of conventional and sustainable farming systems in South Dakota have been estimated as part of our research. Such price increases could result either from supply and demand factors in petroleum markets or from special taxes on petroleum-based inputs. We simulated, in the whole-farm budgets, 50% increases over 1988 levels in fuel, inorganic

nitrogen fertilizer, and herbicide prices and a 25% increase in crop drying costs.

Those hypothetical price increases reduce the profitability differences between conventional and sustainable case farms by \$15/acre and \$7/acre in the east-central and south-central areas, respectively. In the northeast area, such price increases reduce net income by \$6/acre more on the conventional farm than on the sustainable farm—making the sustainable farm more profitable than the conventional farm, even when organic premiums are ignored. Profitability is decreased by \$4/acre and \$2/acre more on the conventional farm than on the sustainable farm in the northwest and southwest areas, respectively, as a result of such price increases. Ignoring organic premiums, the original profitability advantage increases for the northwest sustainable farm and vanishes for the southwest conventional farm.

Overall, it is clear that future increases in the prices of purchased agricultural inputs which are derived in part from fossil fuels will enhance the relative profitability of sustainable farming systems.

Inclusion of livestock on sustainable farms

Nine out of 12 sustainable farms for which economic analyses were conducted have livestock. This section of the report is based upon an integration of the results of the respective sustainable crop rotation budgets, enterprise budgets for some conventional crops and rotations on those

farms, and livestock budgets on those nine sustainable farms.

All nine of these farms raise beef cattle; two also raise hogs. Seven of the nine cattle producers have beef cow herds, with herd sizes ranging from 15 to 150 cows. Most of the cattle operations are rather modest in size, with only two having gross cattle receipts exceeding \$36,000. In the two exceptional cases, gross cattle receipts amount to \$61,790 and \$234,320.

Net income is reported here in terms of income after subtracting all costs except management. Strict attention was given to all economic opportunity costs of production, including all out-of-pocket costs plus imputed values for (a) interest on investment and variable costs—even if producers did not actually borrow money to finance the expenditures; (b) labor—even if the labor was provided by the producer and his family; (c) home-raised feed, at prices that could

have been received if the feed had been sold, not the costs of feed production; and (d) investment in and real estate taxes for all land, including permanent pasture. In most cases, such net returns considerably understate annual cash flows available to producer families to meet living expenses.

With expected cattle prices for 1988 used in the analysis and home-raised feeds priced at market values to the livestock, all nine cattle producers realize negative returns to management.¹¹ With one exception, however, the negative returns do not exceed \$6,800.

The two hog producers in the study have farrow-finish operations. One has 12 sows and

the other 45 sows. With prices estimated in a manner similar to that for beef cattle, both producers realize positive returns to management (\$7,460 and \$34,990).

On five of the nine farms, the gross value of sales from livestock exceeds that from crops (including government payments). Three of these farms are quite equally balanced between crops and livestock and two are weighted heavily in favor of the livestock. The other four farms realize considerably more gross income from crops than livestock.

Under expected 1988 commodity and input prices, whole-farm returns to management are widely variable for the nine farms. Six have positive net incomes, with the highest being \$43,900, and three have negative net incomes, with the biggest loss amounting to \$25,665. For eight of the nine case farms, crops contribute to net income more strongly than livestock.

¹¹ In the whole-farm analysis of the east-central case sustainable farm **when livestock were included**, a "typical year" approach was used (the same as for the other sustainable farms), rather than a 6-year average as reported in Table 1 for the crops portion of this farm.

Implications of Alternative Policies

Government farm policy can have much impact on absolute and relative profitabilities of conventional and sustainable farming systems. For example, the two east-central South Dakota case study farms benefited from government payments in such forms as deficiency payments, payments for optional paid acreage reductions (including participation in

the "0-92" program), and amounts by which government commodity loan levels exceeded market prices in some years. These payments averaged \$27 and \$33/acre over 5 years (1985-1989) for the sustainable and conventional farms, respectively.

On a 700-acre whole-farm basis, the government pay-

ments averaged \$18,900 for the sustainable farm and \$23,100 for the conventional farm. These payments were 16% of the average gross income and 66% of the average net income for the sustainable farm (ignoring organic premiums), and they were 15% of the average gross income and 55% of the average net income for the conventional farm.

SDSU's grant from the Northwest Area Foundation has had a major focus on the implications of possible alternative farm and environmental policies on the relative economic attractiveness, to farmers, of conventional and sustainable farming systems. Among the alternative policies analyzed were (1) a tax on commercial fertilizers and pesticides; (2) reduced target prices; (3) mandatory supply controls; and (4) programs involving more planting flexibility than government programs of the 1980s.

Tax on fertilizers and pesticides

A tax on commercial fertilizers and pesticides is an environmental policy option often discussed at state levels as a possible means to reduce the application of chemical inputs which may threaten groundwater quality.

Thus far, taxes of this nature, such as the one in Iowa, have been set at rates which help raise revenues for monitoring, research, and education on groundwater quality; however, the rates are not high enough to significantly discourage use of the chemical inputs. We examined a considerably higher rate, 25% of the retail price of commercial fertilizers and pesticides.

When chemical input prices were increased by 25% on the east-central South Dakota case farms, the 1985-1989 5-year average of net income after subtracting all costs except management decreased by only \$1/acre (from \$41 to \$40/acre) for the sustainable farm. This

is because chemicals (in limited quantities) were used on only a portion of that farm. On the conventional farm, however, average net income for the 5-year period decreased by \$9/acre (from \$60 to \$51/acre).

Chemical input price increases of this magnitude do not appear to be sufficient, by themselves, to equalize the net returns for the two types of farming systems. However, the higher chemical input prices, together with organic premiums for some of the products of the sustainable farm, could be sufficient to bring net returns of sustainable systems close to or higher than those of conventional systems.

The effects of such a tax are greatest on conventional farms in the eastern part of the state, where there are more row crops and where conditions are conducive to more intensive use of chemicals. In general, however, a 25% tax does not appear to be sufficiently steep to cause farmers to switch from conventional to sustainable systems except where the systems are of near equal profitability without the tax, as in the wheat growing areas. Of course, such a tax could very well induce conventional farmers to reduce their fertilizer and herbicide application rates without completely changing their crop rotations or radically reducing their purchases of chemical inputs.

Reduced target prices

A second policy option is to further reduce federal farm commodity program target prices. Under the 1985 Food Security

Act, target prices were held constant the first 2 years (1986 and 1987) and then reduced in stages over the next 3 years. Primarily because of strong pressure on the federal budget, further reductions in target prices during the 1990s were considered by policy makers. In our analyses, we considered a further decrease in target prices—to levels 25% below those of 1990.

A 25% reduction in target prices lowers the profitability of all the farming systems. The reduction in net income is greater for the conventional farm in each area except the northwest, where the reduction is the same for both the conventional and sustainable farms. In absolute terms, the decrease in net income across all five areas averages \$14/acre on the conventional farms and \$8/acre on the sustainable farms (using 1990 as the baseline, for comparison). Conventional farms tend to have a higher proportion of their acreage devoted to program crops covered by target prices and resulting deficiency payments; hence, reductions in target prices normally have greater absolute effects on net incomes of the conventional farms than on net incomes of the sustainable farms.

In the northeast area, the reduction in target prices shifts the sustainable farm from "less" to "more" profitable (ignoring organic premiums) than the conventional farm. The reduced target prices cause the sustainable farm in the southwest area to shift from "equally" to "more" profitable than the conventional farm. However, in the corn-soybean areas of south-central

and east-central South Dakota, the greater reductions in profits on conventional farms do not appear to be sufficient to induce changes from conventional to sustainable systems.

Mandatory supply controls

The third policy option we analyzed consists of a mandatory acreage control program, patterned in part after Senator Tom Harkin's proposed "Save the Family Farm Act" of 1986. In the scheme which we analyzed, minimum price supports, in the form of loan rates, were set at 72% of parity in 1990. There are no target prices or deficiency payments under the supply control policy option we analyzed. Relatively high (33%) mandatory acreage set-aside requirements were assumed for program crops, including soybeans, in attempts to raise market prices to support levels.

Mandatory supply controls implemented through severe restrictions on the planted acreage of "program" crops were found to favor the conventional farming systems. This is primarily because of the very high prices induced by those restrictions on crops (e.g., corn, soybeans, wheat) tending to predominate in conventional systems. In principle, however, one could design a mandatory acreage control program which requires compliance with certain sustainability practices, such as the use of crop rotations which include legumes. Alternatively, taxes on commercial chemical inputs might be used to partially offset the effect mandatory acreage controls tend to have on application rates of those inputs.

Planting flexibility options

Various proposals for increased planting "flexibility" were offered and discussed in debates leading up to passage of the 1990 Farm Bill (the 1990 Food, Agriculture, Conservation, and Trade Act). Although ultimately not adopted, a Normal Crop Acreage (NCA) program was the Bush administration's original proposal for the new 5-year farm program. We included in our analysis an NCA policy option patterned after that of the Bush administration.

In such an option, an NCA for a farm is established by summing the individual crop acreage bases and historical oilseed (i.e., soybeans, sunflowers, rapeseed, and canola) plantings for the farm. Any combination of program crops and oilseeds may be planted on the NCA. The planting and harvesting of non-program or non-oilseed crops on the NCA results in a reduction in deficiency payments. In our case study NCA calculations—since none of the case farms grew sunflowers, rapeseed, or canola—the only oilseed crop considered was soybeans.

Government deficiency payments in the NCA option just described are based on historical plantings and base yields—i.e., they are essentially "decoupled"—except for deductions based on any planting of harvested non-program or non-oilseed crops on the NCA. We also analyzed a second version of the NCA option, in which harvesting of legumes and other non-program crops (such as millet and buckwheat) planted on the NCA base was allowed without any deduction

from deficiency payments. In both versions, set-aside requirements had to be met, meaning legumes or other crops could not be harvested on the set-aside acres.

The research results indicated that NCA proposals do offer some promise for encouraging more use of sustainable farming systems. Where conventional corn and soybean production is quite profitable, as in parts of eastern South Dakota, NCA options by themselves appear to be insufficient to induce changeovers from conventional to sustainable cropping systems. In wheat growing areas of northern and western South Dakota, however, where conventional and sustainable systems often may be at near equal profitability, NCA policies could significantly influence conversions from conventional to sustainable systems, particularly if deficiency payments are not reduced for harvesting legumes and other non-program crops on NCA base (the second NCA version analyzed). To achieve this positive effect on sustainable systems, it may be necessary for NCA policies to be structured and introduced gradually, in ways that limit adverse effects on the markets for legumes and other non-program crops which are important in the rotations of existing sustainable farmers.

A rather complex form of flexibility was approved as a pilot program in the final version of the 1990 Farm Bill. The pilot Integrated Farm Management Program Option (IFMPO) is a voluntary commodity program designed to give farmers additional flexibility in developing more diverse, resource-con-

serving crop rotations. The IFMPO provides farm program payments for planting resource-conserving crops on acres eligible for deficiency payments and allows **some** harvesting of set-aside acres. To participate in the IFMPO, a farmer must plant at least 20% of his or her crop acreage base to resource-conserving crops.

A limited analysis was conducted for the IFMPO, using the case farms in the two corn-soybean agro-climatic areas (the south-central and east-central areas) and in one of the wheat areas (the northwest). The analysis indicated that participation in the IFMPO, together with adoption of associated sustainable-type farming practices, generally does not appear economically advantageous for conventional farms in

the corn-soybean areas. In the wheat area included in the analysis, the IFMPO appears advantageous for the conventional case farm—because the sustainable practices it could adopt in association with the IFMPO are attractive economically and because the farm could continue to receive deficiency payments on corn, even though corn no longer would necessarily be part of the farm's crop rotation.

Results also were mixed regarding whether or not the IFMPO is economically advantageous to farms already using sustainable practices. A provision of the IFMPO (as interpreted during the 1991 crop year) which reduced its attractiveness for some such farmers in the first year of operation was one specifying that traditionally

"underplanted" program crop acres are not eligible for deficiency payments. However, this provision has been changed starting with the 1992 crop year.

Overall, increased planting flexibility appears to have potential for encouraging more farmers to adopt "sustainable" practices. However, a "general" program (as opposed to a "pilot" program) somehow needs to be less complex than is the IFMPO. Perhaps a version of the NCA which allows deficiency payments to be paid on at least some acres of harvested resource-conserving crops needs further consideration by policy makers. In a way, that is what the IFMPO does. The IFMPO, however, presently entails a great deal of complexity.

Implications for Rural Communities

As debate about sustainable agriculture continues to broaden, the role of sustainable agriculture in revitalization of rural areas is receiving increased attention. Critics of sustainable farming systems often contend that farm conversions from conventional to sustainable systems would adversely affect rural community economies, primarily because of fewer purchased inputs by sustainable farmers from local agricultural supply firms. Others suggest that sustainable agriculture may provide a foundation on which the economic health of rural communities can be strengthened.

As part of SDSU's research under its Northwest Area Foundation grant, **short-term** economic effects of conversions from conventional to sustainable farming systems were examined. We estimated the rural area personal income effects of such conversions, breaking out direct (or primary) effects on agricultural households (including both family and hired labor) and indirect and induced (or secondary) effects on (1) backward linked businesses in the local community (fertilizer and machinery dealers, etc.), (2) forward linked businesses (e.g., local grain handling businesses), and (3)

local businesses which sell consumer goods. The forward and backward linkages are illustrated in Figure 2. Data from the case study conventional and sustainable farms in south-central, east-central, northeast, northwest, and southwest South Dakota were used in the quantitative analysis.

The analysis showed that the largest personal income effects within rural areas of conversions to sustainable agriculture are those on the agricultural households themselves. Estimated effects varied somewhat among the five local study

areas, but indirect and induced personal income effects average \$0.87 for each \$1.00 of direct effect.

Of the indirect effects, backward linkage effects were found generally to be of much greater significance than forward linkage effects; this reflects, in part, the general lack of local value-added agricultural industries in South Dakota.

Because (1) agricultural households were estimated to have less personal income with sustainable systems (not counting organic price premiums) than with conventional systems in all case study areas of South Dakota except in the northwest area and (2) most of the short-run indirect and induced personal income effects on non-agricultural households were negative, **overall** personal income effects of the hypothesized change to sustainable systems were negative in all areas except the northwest. Negative indirect personal income effects tended to be especially high in the retail

trade subsector, which included agricultural chemical dealerships.

These results were based upon analysis which ignored organic premiums. As has been noted previously in this report, taking organic premiums into account reduces, and in some cases eliminates, net income differentials between conventional and sustainable farms. Inclusion of organic premiums in rural community sensitivity analyses enhanced agricultural household personal incomes in four of the five case comparisons, thereby offsetting some of the negative secondary forward and backward linkage personal income effects associated with conversions to sustainable systems.

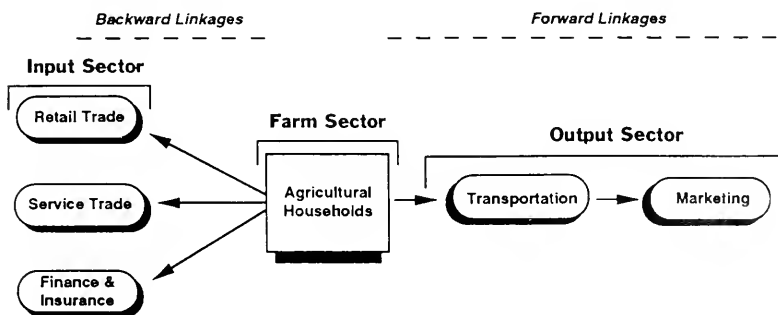
In the longer term, a variety of on- and off-farm adjustments might take place which could alter these estimates. For example, as research on "sustainable" agriculture technologies intensifies over the next few years, **relative** economic profitabilities of sustainable

systems are likely to be enhanced. Changes in federal farm programs and energy prices also are likely to increase the relative profitabilities of sustainable practices.

Both agricultural household income and induced secondary effects would be impacted by those changes. Thus, long-term rural economy effects of conversions from conventional to sustainable agricultural practices are likely to appear more positive (or less negative) than the short-term effects we estimated.

A variety of other rural economy changes also are likely to accompany conversions to sustainable systems after structural adjustments have had time to take place. For example, some agricultural input suppliers may increasingly become providers of information services—such as integrated pest management, fertility management, specialty crop management, etc. This could replace some of the lost economic activity in chemical fer-

Fig 2. Conceptualization of conventional and sustainable agriculture effects on local economies.



tilizers and pesticides. Thus, as demands for some types of conventional agricultural inputs decline, demands for other, less conventional inputs may increase. Likewise, as farmers diversify into other crops in the process of adopt-

ing sustainable rotations, the need for new and different types of local marketing facilities, machinery, and services is likely to expand.

In short, the "structure of agriculture" could change if there

were widespread shifts by farmers to sustainable practices. This could have substantial implications for rural community economies, especially if the viability of moderate-sized family farms were strengthened.

Conclusions

Sustainable agriculture takes on different **agronomic** dimensions in different agro-climatic areas. For example, differences between sustainable and conventional farmers in application rates of synthetic chemical fertilizers tend to be much greater in the eastern corn-soybean areas of South Dakota than in the northeastern and western wheat areas. Consequently, **economic** differences between sustainable and conventional farmers also vary by agro-climatic area.

There are substantial differences in profitability between sustainable and conventional farms in the corn-soybean areas when organic premiums are absent or ignored. There appears to be less difference in profitability in the wheat areas. In fact, when organic premiums for those farms that qualify are factored in, sustainable farms in the wheat areas appear to be slightly more profitable than their conventional counterparts.

Higher energy prices and federal farm policies which permit greater planting flexibility without sacrifice of support payments will enhance the **relative** profitability of sustainable

systems. In wheat areas, such changes in the years ahead could often tip the balance, making sustainable systems more profitable even without organic premiums. More dramatic changes in prices or federal farm programs—or in a combination of those factors **and** in environmental policies—would be required for sustainable systems to generally be more profitable than conventional systems in corn-soybean areas.

We are likely to see a stronger set of **incentives** for sustainable systems and **constraints** on conventional systems in areas that are particularly vulnerable environmentally to conventional farming practices. Corn-soybean areas in which groundwater quality is of increasing concern constitute an example.

While a number of policy options and their respective implications have been clarified in this study, further research is needed to design policy sets which incorporate **combinations** of federal farm commodity program policy (e.g., increased planting flexibility, together with conservation compliance provisions) and

environmental policy (e.g., taxes or application restrictions on particular chemicals).

Rapid widespread conversion from conventional to sustainable farming systems could cause some economic adjustment difficulties for rural communities. However, most economic conversions take place gradually over time. Hence, some adverse effects shown in this study's analysis would likely be mitigated. Moreover, there could be a number of positive long-term effects on rural communities from conversions to sustainable systems. These are difficult to quantify in advance. **If** systems can be developed which enhance the long-run economic and environmental sustainability of moderate-sized family farms, then the economic health of rural communities also may be enhanced.

This study has identified some key differences between "sustainable" and "conventional" farming systems in South Dakota **at this point in time** (1992). It has also provided some tentative ideas about the relative economic attractiveness to farmers of selected systems, given current and possible

alternative farm and environmental policies.

Much of the analysis was based upon **case studies**.

Case studies are extremely valuable in providing specific, detailed insights. However, caution must always be used in generalizing from such studies. A great deal of judgment is required in selection of cases for study, and whatever cases are selected will not be representative of all systems or situations in a given agro-climatic

area. Consequently, profitability comparisons based upon case studies should be considered indicative, not definitive.

Moreover, technologies and systems for a more sustainable agriculture are very fluid at the present time. With much new research having begun in just the last 4 or 5 years, and with many farmers now themselves experimenting with more "sustainable" practices and systems, new insights are rapidly emerging. Farming systems thought

by some to be best today may be replaced by other farming systems a few years from now, as research and farmer experimentation bear fruit.

Thus, this report should be considered a partial picture of a rapidly changing scene. Even with that qualification, it should be useful to farmers, policy makers, researchers, and educators as they attempt to develop a sustainable agriculture for South Dakota and the northern Great Plains.

Publications Resulting from
Northwest Area Foundation Grant to SDSU,
"Sustainable Agriculture as a Rural Revitalization Strategy:
Public Policy Influences"

South Dakota's sustainable agriculture farmers. By D.C. Taylor and T.L. Dobbs. SDSU Econ Newsletter 264. Nov 21, 1988. 4pp.

Presents preliminary findings from a Summer 1988 mail survey of 32 South Dakota sustainable farmers.

"Sustainable" ag: focus on producers. By D.C. Taylor and T.L. Dobbs. *South Dakota Farm & Home Research* 40(1):11-18. 1989.

Presents overview of findings from the Summer 1988 mail survey of sustainable farmers in South Dakota.

Sustainable agriculture in South Dakota. By D.C. Taylor, T.L. Dobbs, and J.D. Smolik. SDSU Economics Research Report 89-1. April 1989. 107pp. (\$6.00)

A comprehensive report of the Summer 1988 mail survey of 32 sustainable farmers in South Dakota.

Describes (1) the nature of the sustainable farms and farmers, (2) the farm production and marketing practices followed by the farmers, and (3) the farmers' evaluation of comparative yields, profits, and problems with sustainable vs. conventional agriculture. The insightful responses from individual respondents to a wide array of questions on sustainable agriculture are documented in a series of annexes.

Economic considerations in evaluating alternative agricultural practices. By T.L. Dobbs and D.C. Taylor. In Proceedings of 1989 Annual Meeting of the Great Plains Agricultural Council, Lubbock, Texas. pp 109-131. (\$1.50)

Describes economic considerations in farmer, public, and policy maker decisions about low-input/sustainable agriculture practices. Results of selected economic studies are presented, and policy and research issues for the Great Plains are identified.

Farmer economic evaluation of sustainable agriculture in South Dakota. By D.C. Taylor and T.L. Dobbs. Selected paper presented at the 1989 Annual Meeting of the Western Agricultural Economics Association in Coeur d'Alene, Idaho on July 9-12, 1989. 10pp. (\$1.00)

Presents the evaluation of 32 South Dakota sustainable farmers on relative (1) crop yields, (2) farm profits, (3) farm labor requirements, and (4) production and marketing problems with sustainable vs. conventional farming practices.

South Dakota's sustainable agriculture technology. By D.C. Taylor, T.L. Dobbs, and J.D. Smolik. Selected paper presented at the 1989 Annual Meeting of the American Agricultural Economics Association, Louisiana State University, Baton Rouge, July 30-Aug 2, 1989. 13pp. (\$1.00)

Describes (1) the sustainable production techniques—involving synthetic chemical input practices: crop rotations: special weed, insect, and disease control practices: special tillage and residue management practices; and special grain drying and storing practices—and (2) the sustainable marketing practices and experiences of 32 sustainable farmers in South Dakota.

Farm program participation and policy perspectives of sustainable farmers in South Dakota. T.L. Dobbs, D.L. Becker, and D.C. Taylor. SDSU Econ Staff Paper 89-7. Oct 1989. 17pp. (\$1.50)

Presents information on current participation in federal commodity programs and views by 21 South Dakota sustainable farmers concerning desired changes in federal farm programs and actions by state and local governments to promote sustainable agriculture.

Crop and livestock enterprises, risk evaluation, and management strategies on South Dakota sustainable farms. D.C. Taylor, T.L. Dobbs, D.L. Becker, and J.D. Smolik. SDSU Res Rep 89-5. Nov 1989. 98 pp. (\$6.00)

A comprehensive report of the Jan-Mar 1989 personal interview survey of 22 South Dakota sustainable farmers. Describes (1) who the sustainable farmers are, (2) their crop rotations, (3) their livestock enterprises, (4) their judgments on the relative riskiness of sustainable vs. conventional farming, and (5) managerial strategies for overcoming critical problems with sustainable agriculture.

On-farm management of sustainable agriculture. D.C. Taylor, T.L. Dobbs, D.L. Becker, and J.D. Smolik. SDSU Econ Commentator 277. Dec 5, 1989. 3 pp.

Presents the views of 22 sustainable farmers concerning on-farm managerial practices and off-farm strategies for dealing with transition weed problems, transition nitrogen shortages, inadequate markets for "organic" produce, and inadequate information about sustainable agriculture.

LISA public policy: from capitol to courthouse, debate over ag and environment continues. By T.L. Dobbs, D.L. Becker, and D.C. Taylor, and **LISA in the "real world": veteran producers report how they farm and the risks they encounter.** By D.C. Taylor, T.L. Dobbs, D.L. Becker, and J.D. Smolik. *South Dakota Farm and Home Research* 41(1): 3-6, 10-13. 1990.

Presents summary information on the sustainable crop rotations, crop cultural operations, and livestock management practices followed by 22 sustainable farmers in South Dakota. Covers views of farmers on the relative risks with sustainable and conventional agriculture and managerial strategies for overcoming several potential problems with sustainable agriculture. Presents summary information on the views of 21 sustainable farmers in South Dakota on desired changes in (1) the federal farm program regarding flexibility on crops grown, conservation/environmental compliance, and a variety of other policy issues and (2) state and local government actions regarding education, research, and environmental quality controls and incentives.

On-farm research comparing conventional and low-input/sustainable agricultural systems in the Northern Great Plains. By T.L. Dobbs, J.D. Smolik, and C. Mends. Ch. 15 in *Sustainable Agriculture Research and Education in the Field: A Proceedings*, B.J. Rice (ed.) Washington, D.C.: National Academy Press. 1991. pp. 250-265. (\$1.50)

Presents comparative 5-year yield and whole-farm economic results for a conventional farm and a sustainable farm in east-central South Dakota. Covers results for each farm for the baseline 1985-1989 period, with and without organic commodity price premiums. Also covers simulated alternative policy situations involving (1) an assumed 25% increase in purchased chemical fertilizer and herbicide input prices and (2) an assumed 25% reduction in federal farm program target prices for corn and small grains.

Crop enterprise and principal rotation budgets for sustainable agriculture case farms in South Dakota. By D.L. Becker, T.L. Dobbs, and D.C. Taylor. SDSU Economics Research Report 90-2. May 1990. 79 pp. (\$5.00)

Describes procedures for and underlying assumptions used in determining individual baseline sustainable crop enterprise and overall crop rotation budgets. Presents budget spreadsheets for 12 South Dakota sustainable farms. Economic effects of organic commodity price premiums are briefly explored.

Crop enterprise and whole-farm budgets for "conventional" farming systems in five areas of South Dakota. By J.D. Cole and T.L. Dobbs. SDSU Economics Research Report 90-3. July 1990. 47 pp. (\$4.00)

Describes procedures for and underlying assumptions used in preparing budgets for "conventional" farming systems. Presents baseline whole-farm budgets for one actual conventional and four synthetic conventional farms in different areas of the state.

On-farm sustainable agriculture research: lessons from the past, directions for the future. By D.C. Taylor. *Journal of Sustainable Agriculture* 1(2):43-88. 1990. (\$2.00)

Covers the unique roles of on-farm research in (1) documenting the sustainable practices and experiences of commercial sustainable farmers and (2) experimenting with new sustainable practices/enterprises on the fields of commercial sustainable farmers. Presents a review of the on-farm sustainable agriculture research undertaken over the past 15 years in the U.S. and outlines four critical methodological issues facing the next generation of on-farm sustainable agriculture researchers.

Sustainable agriculture policy analyses: South Dakota on-farm case studies. By T.L. Dobbs, D.L. Becker, and D.C. Taylor. *Journal for Farming Systems Research-Extension* 11(2): 109-124. 1991. (\$1.50) A longer version of this article was presented as Staff Paper 90-5 at the 10th Annual Symposium of the Assoc. for Farming Systems Research-Extension, East Lansing, MI.

Presents the effects of alternative public policies on the relative profitability of "conventional" and "sustainable" farming systems in five agroclimatic areas of South Dakota.

Effects of public policies on the relative profitability of conventional and sustainable farming systems. By T.L. Dobbs, D.L. Becker, and D.C. Taylor. SDSU Econ Commentator 290. Nov. 6, 1990. 4 pp.

Provides an overview of the comparative effects of reduced government farm program target prices on the profitability of five pairs of "sustainable" and "conventional" farms in South Dakota.

Comparisons of sustainable and conventional crop enterprise budgets in South Dakota. By J. Cole (with assistance from S. Van De Werff). SDSU Economics Pamphlet 90-1. Nov. 1990. 40 pp. (\$3.00)

Compares "conventional" and "sustainable" crop enterprise budget costs, by key cost categories. Also compares yield estimates. Data drawn from several sources.

Implications of a mandatory supply control program for sustainable agriculture in South Dakota. By D.L. Becker and T.L. Dobbs. SDSU Economics Research Report 90-6. Dec. 1990. 31 pp. (\$3.00)

Examines the comparative profitability and wider economic implications of a mandatory supply control program for selected "sustainable" and "conventional" farming systems in South Dakota.

Livestock budgets and whole-farm economic analysis: South Dakota sustainable agriculture case farms. By D.C. Taylor, C. Mendis, and T.L. Dobbs. SDSU Economics Research Report 90-7. Dec. 1990. 88 pp. (\$6.00)

Describes the underlying assumptions and production coefficients for the various beef cattle and hog production enterprises on nine sustainable case farms in South Dakota. Presents the results of whole-farm economic analysis in which the various livestock and crop enterprises on the respective farms are integrated with each other. Results of analyses of (1) livestock price sensitivity and (2) on-farm manure production and disposition are also presented.

Integration of crop and livestock enterprises: South Dakota sustainable case farms. By D.C. Taylor, C. Mendis, and T.L. Dobbs. SDSU Econ Commentator 293. Jan. 31, 1991. 4 pp.

Provides an overview of the linkages between crops and livestock on nine sustainable case farms via home-raised feed production for on-farm livestock use, livestock manure production and use on cropland, and the relative importance of crops and livestock in generating income on the respective farms.

Rural economy implications of farms converting to sustainable agriculture practices: some estimates for South Dakota. By T.L. Dobbs and J.D. Cole. SDSU Economics Research Report 91-1. Feb. 1991. 55 pp. (\$5.00)

Presents some of the rural economy implications of conversions from "conventional" to "sustainable" farming systems in five areas of South Dakota. Describes underlying assumptions and the nature and magnitudes of (1) direct agricultural household effects, (2) first-round indirect backward- and forward- linkage effects, and (3) additional multiplier effects, e.g., consumer expenditures by farm households, purchases of supplies by forward- and backward-linked firms, and purchases of consumer goods by owners and employees of firms affected by various rounds of expenditures.

Impacts of rising energy prices on the attractiveness of sustainable farming systems. By T.L. Dobbs and J.D. Cole. SDSU Economics Staff Paper 91-4. June 1991. 29 pp. (\$2.50)

Energy costs are compared for case "conventional" and "sustainable" farms in five different agro-climatic areas of South Dakota. Energy costs are broken into fertilizer, herbicide, fuel and lubrication, and crop drying categories. Energy cost increases are simulated to determine effects on relative profitabilities of conventional and sustainable farms.

Potential effects on rural economies of conversion to sustainable farming systems. By T.L. Dobbs and J.D. Cole. Selected paper presented at the 1991 Annual Meeting of the American Agricultural Economics Association, Kansas State University, Manhattan, Aug. 4-7, 1991. (\$1.50) A longer version of this paper has been accepted for publication in the *American Journal of Alternative Agriculture*.

Summarizes study of potential direct and indirect (multiplier) economic effects on local economies of conversions from "conventional" to "sustainable" farming systems in five different agro-climatic areas of South Dakota. Also discusses potential effects which were not quantified in the study.

Crop production management in South Dakota: LISA farmers compared to farmers in general. By D.C. Taylor, D.L. Becker, J.D. Cole, and T.L. Dobbs. SDSU Economics Staff Paper 91-7. September 1991. (\$2.50) Summarizes (1) contrasts in crop production management between LISA and conventional farmers in South Dakota and (2) reactions of panels of LISA farmers, conventional farmers, and other key informants to the existence of and apparent contrasts in crop production practices between LISA and conventional farmers.

Farm program flexibility options and sustainable agriculture. By T.L. Dobbs and D.L. Becker. SDSU Economics Research Report 91-9. September 1991. 42 pp. (\$4.00)

Describes such farm program flexibility options as Normal Crop Acreage programs, the Triple Base program, and the Integrated Farm Management Program Option. Presents results of research which examines the effect adoption of such flexibility options might have on the relative profitabilities of sustainable and conventional case farming systems in South Dakota.

Economic impacts of low-input agriculture on farmers and rural development. By T.L. Dobbs. Paper prepared for Workshop on Sustainable Development of Agriculture. Sponsored by U.S.A. National Academy of Sciences and Bulgarian Academy of Sciences, Sofia, Bulgaria. October 1991. 29 pp. (\$2.50)

Presents research results on, and discusses implications of, low-input agricultural systems for farmers and rural areas. Implications of the research findings for agricultural policies in economic transition countries of Eastern Europe are also discussed.

Mandatory supply controls vs. flexibility policy options for encouraging sustainable farming systems.

By T.L. Dobbs and D.L. Becker. Accepted for publication in the *American Journal of Alternative Agriculture*. (\$1.50, after it becomes available.)

Examines how two very different sets of policy options affect the relative profitability of "conventional" and "sustainable" farming systems. The options consist of (1) mandatory acreage controls and (2) variations of a Normal Crop Acreage (NCA) program.

Beliefs and practices of sustainable farmers in South Dakota. By D.C. Taylor, T.L. Dobbs, and J.D. Smolik. Accepted for publication in *Journal of Production Agriculture*. (\$1.50, after it becomes available.)

Describes—from the standpoints of crops grown, cultural practices, and perceived risks—how "conventional" and "sustainable" farming systems in South Dakota differ. Draws on surveys and interviews with farmer and key informant panels.

FARM, RURAL ECONOMY, AND POLICY IMPLICATIONS OF SUSTAINABLE AGRICULTURE IN SOUTH DAKOTA

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Senator WELLSTONE. Thank you very much, Dr. Taylor, for your excellent testimony.

Ms. Ozer.

**STATEMENT OF KATHERINE OZER, EXECUTIVE DIRECTOR,
NATIONAL FAMILY FARM COALITION, WASHINGTON, DC**

Ms. OZER. Thank you. We appreciate your leadership in examining the issue of alternative agriculture in rural economic development. As you know, the Family Farm Coalition is comprised of 38 family farm and rural advocacy organizations in 30 States. Some of these organizations have been addressing these issues directly on a local and regional level, and I would ask that over the time of your upcoming hearings that people can submit for the record some of their own examples and experiences.

We feel that the Small Business Committee is a particularly appropriate committee to look at how family farm agriculture is and should be a viable "alternative" to corporate agribusiness production. It is a small business. It needs to be viewed as a part of the solution to improving the rural economy. Its role needs to be strengthened, not minimized in the years ahead. Certainly when family farmers from the coalition testified before the Agriculture Committee, we were stressing those kinds of issues, and I think with your leadership in tying those issues together and figuring out what can work, we can look forward to seeing some solutions ahead.

For the past 12 years, family farmers have been suffering under Federal farm policies which has forced over half a million farmers out of business, with thousands more on the brink of economic collapse. I would certainly reiterate or repeat Ron's comments about the current disaster in the Midwest and also looking at the whole situation of how farmers themselves are going to be affected by both the disasters and some of the solutions. Whether the solutions come from SBA, USDA, Farmers Home, local delivery, to respond to the real needs out there, they need to look at what the costs will be and what impact relief efforts will have not just on the farmers themselves who are under water, but on the other farmers around the country who are going to bear some of the shifting costs and effects of the current disaster.

As a coalition, our policy and our position on sustainable agriculture and farm policy in general is really to seek to create a just agricultural system where policies benefit both the regional and ethnic diversity of farmers and consumers of food. Employment in rural areas should be maximized and production systems encouraged which promote widespread ownership of land to reverse the current trend of increasing concentration in corporate control of land and food production.

Some farmers around the country—and certainly testimony today has really pointed to this—have shifted their practices and are farming sustainably or organically and are developing innovative markets. Yet, our concern is that this still does not translate into broad based profitability and sustainability given that current farm prices continue to fall below the farmer's true costs of produc-

tion. The major issue is who has control over production and marketing decisions.

As discussed earlier and as Senator Kohl mentioned regarding what has happened in current farm policy, we believe that the increased "efficiency" of the past 30 years has taken an enormous toll on the environment, on human health, on family farm income, and the quality of farming and community life in rural America. Farmers have been questioning the farming practices they have been taught by the chemical companies, by agricultural extension agents, and others.

But for farmers to make the successful transition to more sustainable farming methods, there must be a complete overhaul of U.S. farm and food policy, one that is both economically and environmentally sustainable. These changes really need to happen from the field in terms of farm worker issues, a farmer's own production methods, to the checkout counter where consumers are paying the price of what has been a very distorted policy, and there needs to be a reexamination of who is paying and who is profiting at whose expense. The role of what changes are needed we feel needs to be looked at in that context.

As Ron mentioned earlier, inadequate income at the farm level increases pressure on the farmer to increase production while working off the farm, which is something that more and more families have been doing in order to survive, imposes additional time and energy constraints on the farm family. Time now spent commuting to low-wage jobs and other family costs such as child care take time away from increasingly labor intensive practices.

It is also clear that, as with the non-agricultural economy, smaller operations are a greater source of employment generation. As Linda Lobao points out in her 1991 book, *Farm and Industry Structure and Socioeconomic Conditions*, "counties with many corporate farms tend to have slightly higher levels of unemployment and lower levels of income. Counties with a lot of corporate farming don't have much opportunity for growth." We feel very clearly there is a direction of the need for smaller family farmers and small businesses to be revitalized to be retained within the rural economy.

In my written testimony I go over some recent USDA publications. Probably the most startling statistic in the USDA report, is that, which has been repeated quite a bit this last few months, "only \$5,742 of the total income from farm operator households in 1990 was income from their farms." Those increasing numbers of people working off farm raise additional questions about the scarcity of those jobs, where those jobs are being created, how many of those jobs are being displaced as a result of trade policy, as a result of dislocation, for other reasons that are not strictly farm-based but definitely have a direct relationship.

In looking at this overall mission of creating a sustainable future and making sure sustainable agriculture is a piece of that whole system, we feel at the Coalition that implementing portions of the 1990 Farm Bill which deal directly with sustainable agriculture is a step in the right direction. It needs to happen. There needs to be a recommitment both at the agency level. That is one step, but that needs to be part of this broader policy.

As you know and we have talked about before, there are many obstacles to farming with fewer chemicals right now which include low commodity prices, insufficient funding and research, which I know will be talked about a little bit later. One point that I want to stress is that some of the credit barriers that have been imposed by banks and Federal lending agencies fail to adequately acknowledge the benefits of changes in farm practices.

I have one example of a family farmer who switched to organic cotton in North Carolina, has a yield that is 200 pounds per acre higher than the average yield, but in order to get a loan, he needs to show the average county yield as part of the overall yield. That bank would not have made the loan except for the pressure now from the Community Reinvestment Act to reinvest in their local community, and we are seeing that around the country with different types of alternative practices, different types of innovative small business ventures.

We would urge this Subcommittee to examine where there could be an additional role of SBA in really helping with farm credit issues, basically the access to the credit as well as when there are problems. One concern is that many farmers who unfortunately are in the midst of the disaster or who have been going through debt restructuring these past 5 years—a major barrier is that they have also had SBA loans, and SBA has been unwilling to come to the table to mediate their credit or to resolve their debt restructuring provisions.

In my written statement I went through a listing of five or six different innovative programs around the country that are linking rural and urban residents and contributing to a more sustainable food production system. One that I want to highlight is right here in Washington, DC. There is a project run by the Capital Area Food Bank with Clagett Farms in Upper Marlboro. It is actually having low income urban residents from DC go out to Clagett Farms, farm organic farm operations, and then bring the produce back into the city and sell it at their own farm stands.

That kind of activity is happening in Missouri with the Missouri Rural Crisis Center acting as the middle person, to try and remove some of the profit that has been taken away from the farm and from the community and reinstate that back into the local level.

The Federation of Southern Cooperatives is involved with efforts in Georgia where six African American women are running a cut flower operation, grossing a lot of money. Others are selling pecans to Ben and Jerry's and finally making a profit after many years of losing out.

What I have done is outlined some of these models, and the major point that we want to make is that these models and these opportunities need to be supported not thwarted by Federal farm policy. There needs to be an effort to move forward on them, but at the same time the limits of their applicability need to be acknowledged. There needs to be an understanding that some of these examples work in some regions for some commodities, but in order for it to result in a major number of farmers staying on the farm or new farmers starting to farm, it needs to be at a much broader level. There needs to be a real understanding of those linkages.

So, I appreciate being here and working with you in this process this next year.

[The prepared statement of Ms. Ozer follows:]



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**TESTIMONY OF KATHERINE OZER, NATIONAL FAMILY FARM COALITION
BEFORE THE SENATE SMALL BUSINESS COMMITTEE;
SUBCOMMITTEE ON RURAL ECONOMY AND FAMILY FARMING ON
ALTERNATIVE AGRICULTURE AND RURAL ECONOMIC DEVELOPMENT:
WEDNESDAY JULY 14, 1993**

Mr. Chairman, I am pleased to testify before the Small Business Committee, Subcommittee on Rural Economy and Family Farming this morning. My name is Katherine Ozer and I am the Director of the National Family Farm Coalition. We appreciate your leadership in examining the issue of alternative agriculture and rural economic development. Family farm agriculture is and should be a viable "alternative" to corporate agri-business production. It is a small business that needs to be viewed as a part of the solution to improving the rural economy. Its role needs to be strengthened not minimized in the years ahead. We hope your attention and the work of other Committees in the Congress and the Administration will re-shape the future for farmers and their families in rural communities across the country.

The National Family Farm Coalition (NFFC) is comprised of 38 family farm and rural advocacy organizations in 30 states. Many of our member organizations have been addressing these issues within their regions. I would ask for you to keep the record open to receive their statements.

The Current Situation:

For the past twelve years family farmers have been suffering under federal farm policies which forced over 500,000 farmers out of business with thousands more on the brink of economic collapse. NFFC seeks to create a just agricultural system where policies benefit both the regional and ethnic diversity of farmers and consumers of food. Employment in rural areas should be maximized and production systems encouraged which promote widespread ownership of land to reverse the current trend of increasing concentration and corporate control of land and food production.

Some farmers have shifted their practices and are farming sustainably or organically and are developing innovative markets. Yet this still does not translate into broad-based profitability and sustainability given that current farm prices continue to fall below their costs of production. The major issue is who has control over production and marketing decisions.

Curt Rohland, NFFC President and Wisconsin dairy farmer stated before the House Agriculture Committee at their February hearing on the state of the rural economy, "We are in a vicious cycle and one that must be broken to achieve real economic revitalization

in this country. That revitalization can only occur on the basis of a vital rural economy - one in which farmers begin to receive a fairer share of the value of what we produce. While the farm-gate price for all commodities has been frozen or declined for most of the past decade, input costs and family living expenses continue to rise. Our nation's "cheap" food policy supply is not cheap for consumers who can't afford food at the grocery store nor is it cheap for the farmer."

For the past thirty years, farmers have been led by chemical companies and agricultural experts to expand production by substituting chemicals and pesticides for labor and land. These new technologies enabled enormous increases in production. Federal farm policy has pushed farmers to produce as much as possible per acre and to expand the size of their farms. This drive to be the lowest cost producer has been seen as "efficient." The increasing size of farms and decreasing number of farmers are seen by some as progress.

Unfortunately, this increased "efficiency" has taken an enormous toll on the environment, human health, family farm income, and the quality of family and community life in rural America. Farmers are questioning the farming practices they have been taught by the chemical companies, agricultural extension agents and others. But for farmers to make the successful transition to more sustainable farming methods, there must be a complete overhaul of U.S. farm and food policy - one that is both economically and environmentally sustainable. From the field to the checkout counter there needs to be a re-examination of who pays and who profits at whose expense.

There needs to be a clearer understanding of the negative impacts of farming operations that are vertically integrated, corporate farms, or contract operations. The vision of Cargill, ConAgra, IBP and Excel and others is to maximize production without regard to the methods of sustainability - whether in the Southeast for poultry; Midwest for hogs or Mexico for other production. Alternative agriculture cannot be seen as just the input side- it must be viewed within the context of who has control over decision-making and marketing decisions. Time-saving inputs - whether larger and more expensive machinery or pesticides to minimize risk and expand production are counter to sustainability yet are often the only answer when one's back is up against the wall. The alternative is to leave farming altogether and the dislocation of the family - losing both one's home, one's employment and the removal of the family farm income from circulating through the rural economy.

Inadequate income puts increasing pressure on the need to increase production, while working off the farm imposes additional time and energy constraints on the farm family. Time now spent commuting to low-wage jobs and other family costs such as child-care, take time away from increasingly labor intensive practices. It is also clear that, as with the non-agricultural economy, smaller operations are a greater source of employment generation. As Linda Lobao points out in her 1991 book Farm and Industry Structure and Socioeconomic Conditions, "counties with many corporate farms tend to have slightly higher levels of

unemployment and lower levels of income. Counties with a lot of corporate farming don't have much opportunity for growth."

Recent Government Research:

A USDA publication released in February 1993 based on 1987 Census Data and more recent Farm Costs and Returns Surveys further document the statistical reality of our failed farm and rural policy. The USDA Economic Research Service (ERS) issued their analysis entitled The Economic Well-Being of Farm Operator Households 1988-1990. This report states, "only \$5,742 of the total income for farm operator households in 1990 was income from their farms." There are 1,738,019 farm operator households in the country according to ERS data. Particularly striking is that 21.9% of those households are below the poverty threshold while the national poverty rate for all U.S. households was 10.7% in 1990. These levels are clearly not economically sustainable.

The recent GAO report; Rural Development: Profile of Rural Areas issued in April 1993 at the request of Members of the Senate Agriculture Committee minimizes the role of agriculture in many communities and counties. We ask the question of why shouldn't there be an increased government role in ensuring that family farms and small businesses are strengthened? The GAO report states, "While farming continues to play an important role in many non-metro areas, it is no longer the primary economic activity for nonmetro America. About 3.9 million people - 1.6% of the total U.S. population - lived on farms in 1990. This represented a decline of 31% since 1980." GAO further states that "in 1988, only 22% of nonmetro counties (516 of 2,349) relied on agriculture as a primary economic activity."

The GAO and USDA studies minimize the regional impacts and the type of industrial and job base that exists to offer employment opportunities in response to lower farm income. Lester Thurow, Dean of the Sloan School of Management at MIT; recently testified before the Senate Energy and Commerce Committee about the impacts of NAFTA, "I would argue the Southeastern part of the United States is going to be the place where you get the biggest negative impacts." Thurow goes on to discuss U.S. Census Bureau data documenting the number of male workers who work full-time yet still fall below the poverty line. That number doubled from 18% in 1979 to 40% in 1990. Thurow states, "the process that is going on in this global economy, where we have one-third of the American work force that can compete in world markets, and two-thirds of the American work force that is basically a Third World work force that cannot compete being paid American wages." NFFC has concerns about the impact of international trade agreements on further draining what are already scarce job opportunities in rural America.

For farmers the levels are even more staggering especially in light of the 20% of farm families who work more than one job yet still fall below the poverty line. The regions of the country that are most in jeopardy in terms of rural poverty and declining farm income are the very same regions that have the most to lose under a NAFTA or GATT agreement. These issues need to be analyzed to forge a new policy that starts to enable workers in their communities to have a stake in rebuilding these regions of

the country.

Creating a Sustainable Future:

In preparation for the 1990 Farm Bill debate, NFFC developed the following broad definition of sustainable agriculture. It is "a system of agriculture based on the widespread ownership of family farms and livestock production facilities, which produce a stable and dependable supply of high quality food, feed, fiber and industrial feedstocks. The primary criteria of sustainability are: 1) ecological soundness of farming practices and technologies, and 2) the economic viability of the system in terms of production level income and government costs."

Funding and implementation of the sustainable portions of the 1990 Farm Bill would help change the direction of existing programs but it must be part of an overhaul of U.S. farm and food policy. Farmers must earn at least their cost of production plus a reasonable return on their investment and labor. This enables a family to work on their farm and utilize new farming practices that make sense environmentally and economically.

Current obstacles to farming with fewer chemicals include: consistently low and declining commodity prices; insufficient funding, research and information to farmers about economically sustainable options and alternatives; research priorities of land grant universities and extension services that promote high-yield, high chemical research and use; and credit barriers imposed by banks and federal lending agencies that fail to adequately acknowledge the benefits of changes in farm practices.

An example of the difficulty of a family farmer attempting to farm more sustainably is illustrated by a recent situation in North Carolina reported by a farm advocate who is working with farmers to try and enable them to receive operating credit. Farmers developing new crops in a region or different production than in the past face the lack of data in the "ASCS handbook" which jeopardizes their access to credit. For example, a former North Carolina contract poultry grower who is now growing organic cotton faced this dilemma. For the past three years he has averaged 746 pounds per acre yet the county yield is only 549 pounds per acre. Since he must show five years of farming history for his loan application his ability to get credit is threatened by having to add in the two years at 549 pounds per acre. Similar examples often become the barrier to credit or to adequate disaster assistance.

After months of paperwork and direct farm advocacy, this farmer did receive an operating loan through a local commercial bank who was compelled to loan in the rural community due to pressure for compliance under the Community Reinvestment Act. Despite this transitional success story and sufficient cashflow, the loan was "secured" by the off-farm income from a government disability check. This organic cotton grower is utilizing alternative practices, as is a shitake grower who used to raise poultry under contract. Despite these limited successes, we question how aggressive lenders; whether FmHA and USDA, FCS, Small Business Administration, or the commercial bank, are at encouraging any of these alternative practices or products.

We urge this Subcommittee to examine whether statutory changes are needed to enable SBA to participate in farm-credit mediation programs as well as debt restructuring provisions that apply to FmHA loans. These could enable farmers to remain on the land when it is the "least-cost" alternative to the federal government. The credit crisis is exacerbated since farmers continue to pay excessively high interest rates due to their "higher risk" and lack of banking options.

The term "rural economic development" often neglects farmers and their contribution to revitalizing the rural community and economy. The goal is to retain more of the profits at the farm and community level. We urge an expanded analysis of the role of the farm in contributing to the economy: the purchases of farm supplies from local implement dealers; ability to hire additional workers on the farm instead of being forced to work two additional jobs to make ends meet and provide health insurance for the family. An analysis of the negative impacts of depressed farm income on the overall tax base affecting all services and other domestic federal programs including food stamps, school lunch, unemployment, housing assistance and other programs resulting from displaced farmers needs to be conducted.

Innovative Programs:

There are innovative programs happening around the country that are linking rural and urban residents and contributing to a more sustainable food production system. Following are examples:

- o In Washington, D.C. there is a project called "From the Ground Up" run by the Capital Area Community Food Bank. It links urban low-income residents of D.C. to farming organic plots at Claggett Farm in Upper Marlboro, Maryland. The urban "farmers" can provide food for their own family and sell at their own farm stands to their urban neighbors. The dual goals of education, food self-sufficiency and developing micro-small businesses is exciting. Efforts are underway to work with a D.C. bank to provide revolving loan funds as start-up. Similar innovative approaches could be part of SBA or FmHA lending programs.

- o The Missouri Rural Crisis Center has developed a Farm to City Marketing Program named, "Patchwork Farm Products - Working Together to Make a Difference." The organization is providing the direct marketing effort for farmers who have limited access to consumers. It is replacing the traditional "middle-men" with an organization that is striving towards changing food and farm policies. They clearly state in their promotional materials, "buying food raised by small farmers through this Farm-to-City Marketing project makes it possible for farmers to make their cost of production. This helps to sustain and rebuild a way of life in Rural America."

- o The Federation of Southern Cooperatives working in the Southeast is committed to expanding cooperatives and credit union financing of local efforts. A cooperative in Albany, Georgia comprised of African-American women grows and markets cut flowers in Atlanta and the East Coast. Last year it grossed \$500,000. Other farmers are raising vegetables in a sustainable manner for sale at local markets and on special contract with WIC recipients

for fresh fruits and vegetables. Their 1992 crop was the first sale of 50,000 pounds of Georgia pecans to Ben and Jerry's Inc. This will evolve into yearly sales of 250,000 pounds from 20 growers with plans to add value by establishing a cracking and roasting operation to add jobs and retain income in the Southeast.

o A women's poultry cooperative growing free-range, "farm-fresh chickens" in Southwestern Iowa. These hormone-free chickens are raised on 60 different farms and marketed locally and within the state to grocery and cooperative markets. Risks remain high due to weather, timing, and the consumer demand for purchasing "free-range" chicken at \$5.00 a chicken.

o Outside of St. Louis, Missouri - Leland and Carol Gaye Eikermann have transformed their 2,500 acre chemical intensive farm that financially bankrupted them in the 1980's as well as the soil to a system of 40 vegetable acres and 350 acres in corn production with no pesticide or herbicide use. They are selling their crops and hormone-free livestock directly through local farmers markets, direct subscribers, visitors or local restaurants. They have 100 subscribers, with more on a waiting list, who each pay \$380.00 for a 24 week season. This provides up-front capital and involves subscribers in both the risk and the enjoyment of a successful season. After struggling with 23 inches of rain in the past 10 days this season may be the riskiest yet. The Eikermann's have gotten some "alternative" financing from supporters but despite a profitable operation, they remain ineligible for other loans. Their operation is job-creating providing 2 full-time jobs for Leland and Carol-Gaye, 2 others full-time and 4-8 part-time.

These models need to be supported not thwarted by federal farm policy. The community and social benefits derived from maintaining the farm operation and supplemental income need to be recognized. While these isolated success stories show farmers working to retain more control over marketing, there are limits to their applicability based on crops produced and regions of the country. While Congress continues to fund multi-nationals and their exports through the Market Promotion Program (MPP), very little support has been given to family farmers and farm organizations in forging new areas of marketing either locally, regionally, nationally, or abroad.

The Missouri Rural Crisis Center brochure states a goal of their project as, "providing an economic base for rural businesses and communities that can relieve some of the economic and employment pressure on our cities." Our goal is to work for changes in federal farm policy that enables broad based economic and environmental sustainability for family farmers and their rural communities. We stand ready to work with your Subcommittee and others in Congress to begin to reverse the devastating losses facing our nation's rural communities through forging new solutions. Again, I thank you for the opportunity to testify before you today.

Senator WELLSTONE. Thank you very much.
Mr. Lukens.

STATEMENT OF JIM LUKENS, PROGRAM MANAGER, APPROPRIATE TECHNOLOGY TRANSFER FOR RURAL AREAS PROGRAM, FAYETTEVILLE, AR

Mr. LUKENS. Thank you. Senator Wellstone, I certainly appreciate the opportunity to be here this morning, and I greatly appreciate the commitment that you stated this morning to the revitalization of rural communities. This revitalization is a subject that is very important to me personally. I make my livelihood working in sustainable agriculture and live my life in rural Arkansas. The need for revitalization there is apparent, as it is throughout rural areas in the country.

Senator WELLSTONE. If I could just interrupt you because what you said was kind of sweet music to my ears. I am not going to give a speech on this at all, but one of the things that surprises me is the extent to which all the issues—jobs and child care and health care and education, small business—people just think of them as urban problems. But these are such compelling questions in rural America. So, I appreciate what you said.

Mr. LUKENS. Thank you.

Senator WELLSTONE. I will not interrupt again.

Mr. LUKENS. Oh, please do.

I would first like to very briefly explain what ATTRA does, the program that I work with. Then I would like to outline—or perhaps reinforce what George Bird mentioned this morning—the two different ways that alternative agriculture relates to rural economic development. Finally I would like to suggest several areas where I believe this Committee could provide assistance to rural people and their communities helping them build greater economic strength.

ATTRA is an information and technology transfer service which is operated by a private nonprofit organization, the National Center for Appropriate Technology. It is for use by farmers nationwide who are striving to make their farming operations and practices more environmentally benign, more economically viable, and more supportive of a high quality life for the farm family and for the rural community of which that family is a part. The program is federally funded through the U.S. Fish and Wildlife Service.

Although the service is particularly interested in environmentally sound management of America's farmland for the sake of wildlife, it also understands that economic viability is the key factor driving adoption of new technology on private farms. At ATTRA we receive between 10,000 and 12,000 inquiries each year from farmers who are trying to protect the environment and improve their profitability.

When considering alternative agriculture and rural economic development, I see two distinct relationships. First, as has been mentioned this morning, agriculture is the base for a rural economy, and alternative agricultural enterprises and practices are among the most promising economic development tools available. American farmers are long known for their ability to innovate, and today

they are strongly motivated to try new methods and new enterprises. The farmers who are calling ATTRA are improving their economic plight by, first, substituting on-farm resources for purchased resources. Second, they are adding or switching to higher value products or value-added crops. Third, they are adding innovative marketing or processing to their array of farm enterprises.

Among the callers who are calling ATTRA is a farmer in Minnesota who wants to expand her sheep flock and reduce her purchased feed by employing innovative pasture management, a simple thing that she can do. A rancher in Oregon wants to diversify production by raising red deer in addition to the cattle that he is currently raising. An orchardist in Kentucky wants to increase the gross income by processing and selling cider as well as fresh apples in the orchard. All of these strategies, resource substitution, alternative enterprises, and innovative marketing are being used by farmers to bring more profit to the farm and more money into the local rural community.

Thousands of farmers are looking for economically viable alternatives. ATTRA, as I mentioned, has received well over 10,000 inquiries over the past year, and although ATTRA really focuses on environmentally sound practices, we still have received over 1,400 questions about marketing and finance in that year.

Other organizations and programs are finding the same high level of interest. The Center for Alternative Plant and Animal Products at the University of Minnesota has sponsored 11 well-attended how-to conferences on topics ranging from Shiitake mushroom production to sheep dairying. Their conference on deer farming attracted over 200 established and potential deer raisers. One hundred and seventy five Missouri residents are calling the Missouri Alternative Center each quarter requesting information about alternative crop and livestock enterprises. The Farming Alternative Center at Cornell University provides growing numbers of New York residents with information about alternative enterprises, marketing options, and business management tips.

All of these and other similar programs, both national and State specific, are working to provide one of the most critical needs that farmers have, farmers who are trying to make changes. That is the need for information. These farmers who are changing, whether the economic development organizations recognize it or not, are each and every one involved in rural economic development activities.

The second relationship, though, other than being the base for the rural economy, between alternative agriculture and rural economic development is that of a model. Long-term sustainability of agriculture gained through balanced attention to economic viability, resource protection, and social values has been carefully explored in recent years. This exploration has been on both the theoretical and the practical levels. Applying the same yardstick of sustainability to American rural economic development has only recently begun. Rural communities like farms will benefit from greater reliance on internal resources. Rural communities and businesses could learn from farmers about the advantages of enterprise diversification. Rural economies would be well-served if they followed farmers' examples by targeting unique marketing opportu-

nities such as eco-tourism in some cases, and if they endeavor to add as much value as feasible to locally produced goods before they leave the community.

But rural communities do need help to accomplish these things. Spurring economic development in rural communities means reversing a downward trend that they have experienced for many years. It always takes a special effort to overcome that momentum. I want to mention 3 areas where assistance would help the sustainable rural economic development.

First, the availability of reliable technical information appropriate to a rural setting and presented as options, not as prescriptions, is one of the greatest needs. Demonstrations and examples with farmers teaching farmers are highly effective ways to transfer new farming technologies and approaches and ensures that those that are shown are appropriate for the circumstances. They provide both ideas and inspiration, and they allow the learner to be able to take responsibility for applying the information to his or her own situation. The techniques should be more broadly applied and it should be utilized in other economic development efforts other than agriculture.

Second, better access to financing, as has been mentioned before, is badly needed. Innovative, small-scale entrepreneurs frequently have 2 strikes against them from the start when they approach a loan officer. The loan they request is relatively small. It requires a high time investment on the part of the loan officer per dollar loaned. The second strike, they are trying something different and something which is less familiar to the lender and frequently has no proven track record. So, encouraging lenders to support small-scale rural enterprises through education and through risk-sharing would be helpful.

Third, rural entrepreneurs need business management assistance, including help with business planning, market development, and help finding the way through the veritable maze that has been mentioned here before of both State and Federal regulations. Rural economic incubator projects can be successful and also very cost effective in providing the encouragement and information throughout the whole process of establishing new small businesses.

In closing I want to emphasize that a healthy agriculture and a healthy rural community are mutually dependent. The rural community cannot be economically healthy and vibrant with a bankrupt agriculture sector. Similarly the good health of farms and farm families and the farm economy requires a rural community that is economically, environmentally, and socially sound.

Thank you very much.

[The prepared statement of Mr. Lukens follows:]



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Testimony prepared for presentation to the United States Senate Small Business Committee's Subcommittee on Rural Economy and Family Farming on Wednesday, July 14, 1993, by Jim Lukens, ATTRA Program Manager.

Mr. Chairman, Committee Members, and guests:

I appreciate the opportunity to testify before this committee today on the topic of alternative agriculture and rural economic development. I would first like to explain briefly the ATTRA program with which I work. Then I will outline two different ways that alternative agriculture relates to rural economic development. And finally I will suggest several resources and services that would help rural people and their communities build greater economic strength.

ATTRA is an information and technology-transfer service operated by a private nonprofit organization, the National Center for Appropriate Technology, for use by farmers and others who are striving to make farming operations and practices more environmentally benign, more economically viable, and more supportive of a high-quality life for the farm family and the rural community of which it is a part. The program is federally funded through the U.S. Fish and Wildlife Service, which is charged with protecting the wildlife of our country. The Service understands, however, that for wildlife, a public resource, to thrive, a privately-held resource, America's farmland, must be managed in environmentally-sound ways.

Economic viability is the key factor driving adoption of new technologies on private farms. ATTRA receives between 10,000 and 12,000 inquiries each year from farmers who are trying to protect the environment and improve their profitability. These questions come from all U.S. states, the Virgin Islands, and Puerto Rico, and involve production of agronomic crops, horticultural crops, and livestock, and fish. ATTRA Information and Technical Specialists utilize information from the scientific literature, from researchers and extension specialists, and from farmers, in answering the questions. We make special effort to ensure that the information we provide is practical as well as reliable.
(Attachment 1)

When considering alternative agriculture and rural economic development, I see two distinct relationships. First, agriculture is the base for the rural economy, and alternative agricultural enterprises and practices are among the most promising economic development tools available. American farmers, long known for their ability to innovate, are today strongly motivated to try new and different enterprises and methods. The farmers who are calling ATTRA are improving their economic plight by substituting on-farm resources for purchased inputs; adding or switching to alternative, higher-profit crops and livestock; and adding innovative marketing or on-farm processing to their farming activities. Among these callers are a farmer in Minnesota who wants to expand her sheep flock and reduce purchased feed by employing innovative pasture management, a rancher in Oregon who wants to diversify production by raising red deer, and an orchardist in Kentucky who wants to increase gross income by processing and selling cider as well as fresh apples. All of these strategies -- resource substitution, alternative enterprises, and innovative marketing, are being used by farmers to bring more profit to the farm, and more money into the local rural community.

Thousands of farmers are looking for economically-viable alternatives. Although ATTRA focuses mostly on environmentally sound farm practices, we still received over fourteen hundred questions about marketing and finance during the past year. Two hundred thirty-nine individuals requested a single information packet we have prepared to help people evaluate and plan a new small farming enterprise. And one hundred people requested our resource list designed to help farmers find information about alternative and exotic enterprises they might want to explore.

Other organizations and programs are finding the same high level of interest. The Center for Alternative Plant and Animal Products, at the University of Minnesota, has sponsored eleven well-attended how-to conferences on topics ranging from Shiitake mushroom production to sheep dairying. Their conference on deer farming attracted over 200 established and potential deer raisers. One hundred seventy five Missouri residents are calling the Missouri Alternatives Center each quarter requesting information about alternative crop and livestock enterprises. The Farming Alternatives Center at Cornell University provides growing numbers of state residents with information about alternative enterprises, marketing options, and business management tips. The state-supported Agricultural Utilization Research Institute in Minnesota is providing business, marketing, and technological assistance to nearly 300 small businesses and family farmers who are trying to add value to both new and traditional agricultural products through processing. The National Agriculture Library's Alternative Farming Information Center has prepared over thirty bibliographies, resource guides, and other publications on alternative farming enterprises and methods.

All of these and other similar programs, both national and state-specific, are working to provide one of the most critical needs of farmers who are changing -- information. And these farmers who are changing, whether economic development organizations recognize it or not, are involved in rural economic development activities. (Attachment 2)

The second relationship between alternative agriculture and rural economic development is that of a model. Long term sustainability of agriculture, gained through balanced attention to economic viability, resource protection, and social values, has been carefully explored in recent years. This exploration has been on both theoretical and practical levels. Applying the same yardstick of sustainability to American rural economic development activities has only recently begun. Rural communities, like farms, will benefit from greater reliance on internal resources, and more attention to protecting and conserving natural and human resources. Rural communities and businesses could learn from farmers about the advantages of enterprise diversification, and movement toward information-intensive management techniques. Rural economies would be well-served if they followed farmers' examples by targeting unique marketing opportunities, such as eco-tourism, and endeavored to add as much value as feasible to locally-produced goods before they leave the community.

But rural communities need help to accomplish these things. Spurring economic development in rural communities means reversing the downward trend that these communities have experienced for years. Special efforts are required to overcome momentum. What would help sustainable rural economic development? I want to mention three areas.

First, availability of reliable technical information, appropriate to the rural setting, and presented as options, not prescriptions, is one of the greatest needs. Demonstrations and examples, with farmers teaching farmers, are highly effective ways to transfer new farming technologies and approaches. They provide both ideas and inspiration, and allow the learner to take responsibility of applying the information to his/her own situation. This technique should be applied more broadly, and utilized in other rural economic development efforts. Existing information providers should be enlisted in rural economic development efforts, and linked more effectively with each other. Additional information and technology-transfer agents are needed as well. One information source or delivery method cannot serve all people or all needs. ATTRA frequently hears from individuals who, for one of a wide variety of reasons, have been poorly served by traditional information sources. Many sources and delivery methods are needed, but they need to operate in complementary, rather than competitive, manners.

Second, better access to financing is badly needed. Innovative, small-scale entrepreneurs frequently have two strikes against them from the start when they approach a potential funding source. The loan they request is relatively small, requiring high time investment on the part of the loan office per dollar loaned. In addition, they are trying something different -- something which is less familiar to the lender or has no proven track-record. Encouraging lenders to support small-scale rural enterprises through education and risk-sharing would be helpful.

And third, rural entrepreneurs need business management assistance, including help with business planning, market development, and help finding the way through the veritable maze of state and federal regulations. Rural economic incubator projects can be very successful and cost effective in providing both encouragement and information at every step of business establishment.

In closing, I want to emphasize that a healthy agriculture and a healthy rural community are mutually dependent. A rural community cannot be economically healthy and vibrant with a bankrupt agricultural sector. The good health of farms, farm families, and the farm economy similarly requires a rural community that is economically, environmentally, and socially sound. Thank you again for the opportunity to testify today.

RECUPLE--
NATURAL RESOURCE STRATEGIES FOR
RURAL ECONOMIC DEVELOPMENT

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EXECUTIVE SUMMARY

The idea for *Recouple* evolved over the past few years. It was based on the observation that a new development approach has emerged in the rural economic development field. Empirical evidence strongly suggests it will be a key to future success for many rural areas. This approach does not seek to repeat traditional industrial recruitment strategies. It also goes beyond business expansion and retention programs. Instead, it seizes upon the uniqueness of existing rural resources to uncover new enterprise opportunities. The historical dependence on the natural resource base that is the common denominator for most rural areas--indeed, the phenomenon that makes for "ruralness"--is not regarded as a liability but rather as an opportunity.

We found that very few technical assistance materials currently exist in the "traditional" economic development literature that show rural areas how to approach local economic development with a focus on natural resource-based strategies. Too often, rural economic development technical assistance materials represent either community development strategies or simplified urban economic development materials. Using these materials, community leaders in the trade centers of rural areas pursue community development or industrial recruitment approaches while rural landowners--farmers, ranchers, and others "outside town"--find assistance elsewhere for their efforts at diversifying or adding value to their current products. The Cooperative Extension Service of the U.S. Department of Agriculture has programs in most states to assist farmers in enhancing their profitability and developing new products and services. Fortunately, many extension agents have taken a strong proactive role in community economic development as well. But even many USDA materials and approaches tend to either deliver to the land-based operator or the community leader in the trade center. There are still only a few examples where a broad perspective and consensus on rural resources and development strategies have been achieved, and where natural resource-based new enterprise development has been effectively woven into an areawide strategy.

We also found that community-based economic development organizations do not usually focus on natural resource-based strategies. It is often assumed that the "old" natural resource primary industries--agriculture, forestry, mining, fishing--are part of the rural problem. And, in one sense, they are--rural areas have paid a price for an overdependency on any one aspect of the resource base when changes in global demand, or technological change, or resource depletion have radically altered the industry and thereby the rural economy. But urban America has endured trauma from overdependency on a few industrial sectors as well. And rural communities overly dependent on a single type of manufacturing industry--textiles, for example--have been caught in the same trap. Lack of diversification--failing to support a broad base of employment and income-generating sectors--has been at the heart of the problem.

We have also observed a disturbing barrier to growth and innovation that appears all too frequently in rural areas. The path being taken by community-based development organizations, chambers of commerce, and the economic development community all too often is separate from the "survival techniques" being tried with farmers, ranchers, and other landowners in the rural hinterlands but outside the trade centers. There is still not enough realization of the necessity to pool resources for regional development activities, and it is still relatively rare for a development group to effectively include strategies to make the most of one of the single most important physical assets of its ruralness--its natural resources.

This publication is an outgrowth of this concern. It is designed to help rural areas weave natural resource-based new enterprise development into a rural county or regional strategy for achieving economic stability and vitality.

A word of caution is needed here. Natural resources are a key asset for rural economic development. But any decision that does not take into account the need to ensure their renewability through a sustainable use strategy is indeed shortsighted. Resource conservation and management, not exploitation, are the keys to long-term sustainability of not only the natural resource base but the very fiber of our rural economies. "Ecological economics" must come to guide our decisions on our resources, and stewardship must replace development as a mission.

A rural area also should not focus on natural resource-based new business growth to the exclusion of all other strategies. What is needed is a broad-based approach. And within that broad approach, equal attention needs to go toward helping landowners organize their efforts and providing business counseling, technical assistance, and capital to potential natural resource-based enterprises. We must foster an environment in rural areas that allows small entrepreneurs to grow "in the countryside" as well as in the rural towns. To do this will require bringing a regional approach to strategic planning for economic development and weaving additional key players--the owners of the natural resource lands--more effectively into the process.

A final word about the title: MRI selected the title *Recouple* because of the increasing use of the term "uncoupling" among economists. One example of the "uncoupling" phenomenon that is often stated is in the increasing separation of the primary goods economy--chiefly agriculture products, forest products, metals, and minerals--from the industrial economy. In other words, the rise or fall of the primary goods sector seems to have little impact on the vitality of the industrial sector any more and vice versa. This is chiefly because most of the value by far is added to the primary product from further processing or management. Value-adding strategies have thus come to be viewed as critical components of rural economic development efforts. It is the intent that this publication will assist rural community leaders, public officials, development specialists, and local and regional organizations recouple their natural resource assets with their economic engines by offering the best available assistance on strengthening, expanding, diversifying, and adding value to their natural resource-based enterprises.

In summary, then, the following is a listing of the questions addressed in the text chapters. A question/answer format was chosen because it was felt to be especially appropriate for use by community leaders in rural areas who would be acting as facilitators for the new ideas. Extensive bibliographic materials are presented in each section that follows a text chapter.

Senator WELLSTONE. Thank you very much, Mr. Lukens.
Ms. Krome.

STATEMENT OF MARGARET KROME, AGRICULTURAL POLICY CO-ORDINATOR, WISCONSIN RURAL DEVELOPMENT CENTER, MT. HOREB, WI

Ms. KROME. Good morning, nearly good afternoon. I appreciate the opportunity to testify today before your Subcommittee. As with the other witnesses, I applaud your initiative in bringing these issues forward and doing so aggressively and with great commitment.

I would like to first tell you a little bit about the Wisconsin Rural Development Center for which I coordinate agricultural policy work. We are a private nonprofit organization founded in 1983 in response to the farm crisis. Our mission is three-fold, supporting an agricultural system based upon small to medium sized family farms, protecting a natural base in rural areas, the air, the water, the soil, and so forth, and fostering strong rural communities. That is not, as you think of it, dramatically different from the concerns which you have heard describing sustainable agriculture. It is remarkable, as we have become involved in sustainable agriculture over the years, how consonant this movement is. As we have worked in Wisconsin doing a great deal of policy work to support new programs, to get a new sustainable agriculture demonstration program in our State, working with, forming indeed, a broad coalition of all the farm groups in the State and the environmental groups in the State to get a new research program at Wisconsin. We find that this set of issues is quite compelling and it is compelling to a broad array of citizens in the State and groups and interests in the State.

Indeed, I would like to take a second and speak to an issue that arises quite frequently when people talk of sustainable agriculture. There is an urge felt by some of my friends at the university and other forums who are a little uncomfortable with sustainable agriculture, to puncture it by asking but what is it really. Does it really have any definable meaning? It is everything to everybody and so forth and so on.

One of the things that is quite important to note about sustainable agriculture is that the witnesses here represent States across the Nation and sustainable agriculture has itself arisen spontaneously without effort from the top in small communities in Kansas, on the hard, lateritic soils in Georgia, the sands in the West. You find sustainable agriculture arising out of genuine concerns of the current policies. I think it is very important to note that in some ways this movement and the definitions of sustainable agriculture are all that much more authentic because without any effort from the top, these same concerns of environmental soundness, profitability, social wellbeing have arisen again and again in all of our States.

Today I am hoping to do the following. First, I want to lay out a few observations about agriculture and sound rural economic development. Second, I want to illustrate some of those thoughts with a couple of examples, case studies, on rural economic development in

Wisconsin, and third, I want to apply some of my thoughts to the whole effort of new industrial uses for agricultural commodities. Finally, I would like to also make some suggestions regarding policy directions in which our national leaders can take to help support sustainable agriculture as an economic strategy.

First, a few of my observations not, of course, too dissimilar from the rest of our panel. Agriculture I want to note is not just farm activity. It is all of the other input sectors. The chemical input sector is currently a very predominant one, any of the other input sectors going into the farming production, then of course following it through the farm production itself, the transportation of the commodities from farm to ultimate consumer, and stopping in the interim at processors and storage facilities, packagers, retailers, distribution centers, retailers, and finally ending up at the consumer's door in presumably the refrigerator.

It is quite important to recognize that as time has gone by, we have had a dropping percentage of the farmer's retention of the value that a consumer pays for food. Maybe 10 cents of it now is going to the farmer itself. It is important to think of that when one considers the rural economic strategies. One of the obvious goals is to try to keep as many of those other sectors in rural areas as possible.

Second observation. Agricultural sustainability applies not just to production, and sometimes we think of sustainable agriculture as really pertaining to that on-farm sector. But we have to think about how sustainable it is to have an input sector which is based so much upon petrochemicals when, indeed, we are a petroleum deficient Nation. Does that make sense? Does it make sense for us to depend so much upon transportation strategies when we can shift more to local consumption and local distribution of food? Do we need to and is it sound for us to emphasize so much over-processing of foods? If we apply the standard of sustainable agriculture and sustainability at all of these levels in the whole spectrum of agriculture, I think we will foster more local and regional markets, more management based, jobs creating farming opportunities and more locally owned processing facilities, and I think that is something we should do.

Third observation. Entrepreneurial self-employment is indeed the majority of employment in rural areas. This is particularly true in the Midwest and certainly studies have borne this out. I do not even need to elaborate upon how important this is. I think George Bird and several others have spoken to the importance of looking less at large industrial development and more at the micro-enterprise and the other locally owned business approach to rural development. I think I am preaching to the choir.

Another important observation is that jobs creation alone is not a sufficient litmus test of sound rural economic development. A question is who retains the profits of community development. What are the benefits to the workers? What are the conditions for work? What kind of management control do workers have? What kind of business reinvestment does business make in the local area? As we are looking at spawning jobs and encouraging rural development, we need to hold our definitions to high standards.

Again, to reiterate others' concerns, another observation is that farmers and rural small businesses need access to credit and often find that access difficult. I think Jim and others have done a nice job of speaking of some of the problems that farmers and other small business people have. I will not elaborate or repeat. I will simply say that it should certainly be axiomatic that farmers need credit, reasonable amounts appropriate to the growth that they think is appropriate for their business at any given time and with fair terms.

We have certainly had a disturbing experience in Wisconsin as one of our staff people has been doing some exploration of rural Wisconsin banks. We find that the Community Reinvestment Act, to which Kathy Ozer referred, is treated as virtually irrelevant by many of the banks in Wisconsin at least. I hear this is true in other States. Indeed, in rural towns around the State, some of them are towns in which the local bank is touted as one of the foremost profitable banks in the State. When our staff went to that town, one of the first comments was made without any solicitation that the bank is not investing in the town. It is very hard to get a loan in the town. It is going into Federal securities. That is where the bank is putting its money. I think this is truly disturbing. We should not be encouraging that.

Another observation is that farmers and rural small businesses need infrastructure, creameries, meat processors, vegetable processors, the other sorts of infrastructure that allow small businesses to flourish.

Again, to reiterate some of the other concerns that people have stated, information is clearly one of the constraints to small businesses and farmers in adopting sustainable agriculture. Sustainable agriculture farmers need information on what the consequences are of their current practices. Are they, in fact, polluting their groundwater? Are they eroding their soil and so forth? What are their alternatives? Are there, in fact, other ways than herbicides to control their weeds? Of course, there are. What are those ways? How could they apply on their farm? Third, what are some of the risks that they might be taking and some of the benefits? What would happen if? It is the what-if scenarios. Farmers need to get information. Also, rural entrepreneurs need the kind of assistance that others have referred to, the how-to training.

I am not going to go into either of my two case examples that I have in my written testimony. One pertains to a very innovative marketing and business development in Wisconsin known as CROPP, the Coulee Region Organic Produce Pool. It has become a nationally known model, interestingly enough, started by farmers with, I am sorry to say, very little Government assistance. It has grown to be a very thriving rural enterprise, indeed, the second largest employer in its area now. It illustrates several important points, and I will simply speak to those points.

One is that it continues to have difficulty in obtaining credit. One of the principals in CROPP spoke very directly to this point and, when he heard that I was going to testify, urged me to speak to this Committee about the importance of the Small Business Administration's micro-enterprise loans and some of the other approaches which can, in fact, be made more flexible and should be.

He also spoke, as have others, of the importance of your incubator idea, the need to have somebody to help track you through the system. It is far too complex, and it is not as though small entrepreneurs have extensive time on their hands to be doing things that are outside of their expertise. They need help.

It is also interesting and heartening to see that an enterprise like CROPP, springing straight from the good ideas and the passion of people in rural Wisconsin, can and in this case clearly do benefit that community. I will say that CROPP also illustrates what happens when farmers who are participants have good information. This is a case where farmers really have worked together to get the information they are not getting through their extension system and through other agencies, and they should have that access.

I now want to turn to the question of new industrial uses of agricultural commodities.

Senator WELLSTONE. Don't get furious with me, but if you could try to summarize. I want to extend a little bit beyond 12 p.m. so I can at least get a chance to ask some questions of each of you, but if you can try to summarize, I would appreciate it.

Ms. KROME. I surely will.

Senator WELLSTONE. I feel terrible. I feel Jewish guilt saying that to you.

[Laughter.]

Ms. KROME. That is okay.

Senator WELLSTONE. I know that it is hard to do it, but I want to make sure we—

Ms. KROME. Certainly. I am glad to do that.

One of the concerns that I have about the whole new industrial uses of the agricultural commodities agenda is that while there is no doubt that there is a lot of opportunity in this area, I think it is important to remember that we have to be holding again this new agenda to the standard of sustainable new uses of sustainably produced commodities. In my written testimony I described some examples of what might and might not be considered in my view sustainable, and I think that we need to recognize that we ought to be looking for resource conserving crops and we need to be looking for processing facilities that foster local growth. I noticed that Senator Kohl asked a good question of Mr. O'Connell earlier, asking to what extent does that particular program hold initiatives to this standard, and I think that that is a question that should be asked of all programs.

Finally, what kind of policies will support sustainable agriculture and rural economic development based upon sustainable agriculture? Some of the policies are going to be based on the farm bill discussion. Some of the budget considerations this year also pertain to some of the authorizing language, certainly the need for the targeting of our Federal farm programs. As we are looking at targeting them, I think we need to be looking at targeting them for small to medium sized family farms, to fostering environmentally responsible farms. I think that and conservation programs are the kinds of things that we can be doing. I want to elaborate all of those. Certainly FmHA and other credit programs need to be carefully crafted.

I think Senator Kohl also noted quite aptly that in the next couple weeks we are smack in the middle of appropriations, and he spoke to it. I would like to as well briefly, and that is it is quite important—I was glad that you had invited the SARE program Director. Certainly George Bird did an excellent job of describing the program. This is an important program which has been badly underfunded for many, many years. It needs to have a far larger appropriation. It has been authorized at \$40 million. For it to be getting still \$6.7 million after several years of existence of excellent performance is really deplorable and needs to be remedied.

Similarly, an extension counterpart to SARE, is the Sustainable Agriculture Technology Development and Transfer Program. It is a program that is needed to train extension agents on SES, ASCS, the other agency staff to help farmers. It is where it hits the ground, and we absolutely need the training to get our agency staff on the ground.

There are a number of conservation programs which I outline in my testimony, and then I want to speak to a couple of important marketing possibilities.

Senator WELLSTONE. I may need to cut you off, Ms. Krome, because I will not have a chance to ask questions of others and people have come from all over. That will be in the written testimony.

Ms. KROME. Certainly.

Senator WELLSTONE. I was pleased to hear Senator Kohl also talk about that because much of this is coming up within this next month in Senate agriculture appropriations. We will communicate all this to the chair of that committee who happens to be also the chair of this Committee, Senator Bumpers, if that would be okay.

Ms. KROME. Terrific. That would be welcomed. Thank you very much.

Senator WELLSTONE. I apologize for doing that, but I did want to get a chance to at least put a couple of questions to you all.

Will you all be okay if we stay another 15 minutes or so just to go through some questions? Is that all right with everybody?

Mr. KROESE. Yes.

Dr. TAYLOR. Yes.

Ms. OZER. Yes.

Mr. LUKENS. Yes.

Ms. KROME. Yes.

Senator WELLSTONE. OK. We will not finish any later than 10 after.

Ron, one of the things that I wanted to ask you, I do not think it is just a philosophical question. Some environmentalists do not share your view that sustainability implies smaller or moderate size or medium size agriculture. They argue actually that the larger corporate farms are going to be better able to move into this area. I wondered whether you could speak to that.

Mr. KROESE. I would be glad to because it does need some clarification from what I said. I am not necessarily saying that farms have to be small to be sustainable. What I am saying is there is an issue of scale. We hear Wes Jackson talk about the eyes to acres ratio. In other words, there is only so much that can be done well by a farmer or a farm family on the land, and different people have different capacities. Different families have different capac-

ities, but there is a matter of scale that has to be addressed. That is the first thing.

The second one has to do with how we define and what we believe encompasses sustainable agriculture. I think where the issue of scale further comes in is when we really look at biologically based systems. There has been a lot of writing and research on this transition from conventional to sustainable agriculture. If all you are doing is tinkering or just improving conventional agriculture by reducing inputs, I think it is possible to stay at pretty much the scale where you were before. But if one moves all the way over to solar-based, biologically based farms, using more organic methods, then again smaller scale, more labor intensive, management intensive, becomes more of an issue. It has to do with rainfall, climate, a lot of factors, but it is a factor that needs to be recognized I think across agriculture. That is how I would put it.

Senator WELLSTONE. Dr. Taylor, first of all, I appreciated your very well-balanced testimony. Is your point essentially that right now under the current economic and policy conditions, it is hard to say that sustainable agriculture is a sure-fire success, being economically viable, contributing to local economies, but that as the policy shifts occur, that encourage environmental protection, and new local infrastructures are built up to support that, appropriate technology and whatnot, you see sustainable agriculture as being a part of our future? Or is that an inaccurate summary of what it is you are trying to say?

Dr. TAYLOR. No. I think that is a very accurate assessment of the thrust of my position. Sustainable systems are very management intensive, and we can find examples right now of sustainable farmers who are doing very well economically. But the commitment that is required for intensive on-hands management in sustainable systems and a willingness to make short-term sacrifices for the future is very great; I am not sure it is realistic to expect such commitment on a widespread basis across all farm managers today.

If policy can change and particularly if we can get additional funding of research to investigate the possibilities for sustainable agriculture, I am quite confident down the road that we can see a definite movement in that direction, but these are very complex issues and it is going to require policy changes. It is going to require research, and a lot of effort in order to realize those benefits. I think we are kidding ourselves if we say today that sustainable agriculture has shown itself to be a vehicle of rural revitalization. Some of the parameters have got to change before it can get to that stage.

Senator WELLSTONE. One of the things that the people at AURI, the Agricultural Utilization Research Institute, emphasized with me—I met with them up in Crookston in northwest Minnesota—is they put emphasis on research, but they put a lot more emphasis on the actual marketing and going out in local communities. They really think that that is probably the major place where they have been able to thrust some of this forward.

I will ask Ms. Ozer. I suppose that there are a number of different variables here that Dr. Taylor tried to pinpoint, but at the macroeconomic level, I take it that one of your central arguments, Ms. Ozer, is that sustainable agriculture, farmers being able to move in

this direction, the direction of the National Academy of Science report, the impact of pesticides, children, health, and safety, cannot be decontextualized from the need to do something about the whole issue of price. I think maybe it would be helpful if you spelled that out a little bit more.

Ms. OZER. Certainly the two need to be linked together. I think part of it is the actual farm price that farmers are receiving for what they are producing, but it is also being able to keep working on the farm as a full-time job and not to be in a situation where you have to balance your lack of adequate income on the farm with off-farm employment which then further removes the farm family from being able to spend the kind of time and the attention to their own farming operation. I think that has come out time and time again where people are farming sustainably or organically.

Yet, that does not mean that they have enough money at the end of the year to be reinvesting in some of the kinds of things they would like to do on their own farming operation. Whether it is called "value-added" or retaining the income and the profit closer to the farm level is very important, but it needs to be part of an overall system that enables that to happen and does not pull people in all directions.

Senator WELLSTONE. It seems to me that we can, through some good research, through expanding some funding of some programs that are working, through some concrete models that people read about or hear about word of mouth, provoke peoples' hopes and aspirations that they can do it as well. Some of the work that you all have been doing is critically important. This is part of what Ms. Krome was talking about. Also, you can talk about it in a rural economic development framework, but to the extent that you think agriculture still is an important part of that—I know Mr. Lukens made that point and I feel that way—you cannot separate this from some of the big policy questions. You really want, in macro-economic policy, to provide the right set of incentives and disincentives as opposed to what we have right now.

Ms. OZER. I would say that the other piece of it is what is being ignored as to what some of the real costs are of the current policies, what has happened because of low farm income, lack of property tax base, dependence on other Federal programs. If that is reversed, it instills a lot more of a ripple impact that is a positive economic flow from the farm and the community instead of the negative. I think provoking some of that new research—and I know USDA is going to look at some of that from a different perspective, but also within SBA doing some collaborative work—I think would be really valuable.

Senator WELLSTONE. We are going to try to keep every week raising the profile of the Subcommittee, seriously, and we are going to try to see the extent to which we can help influence that.

Mr. Lukens, do you work frequently with SBA or other Federal agencies?

Mr. LUKENS. We do not work frequently with SBA. We do work a great deal with USDA agencies, both information and research agencies.

Senator WELLSTONE. How would you assess the performance of some of the Federal economic development type agencies that you work with?

Mr. LUKENS. Let me focus comments on the information transfer that they do because that is really our end of the business. One of the things that we do in our work is very carefully try to avoid judging the motives of the people who are asking questions. Our responsibility is to provide them information as they see a need for it, not to judge whether they are asking a good question or not. We also are trying to provide them with the full range of information that is available, do it in a responsible way, that is, giving them a clear sense of the reliability and applicability of the information, but not withhold information because we lack full knowledge.

I think that the agency that is most active in rural communities providing information to farmers is the Cooperative Extension Service, which in my view in many cases has put themselves in a very difficult position by raising their standard of reliability to the point that they are feeling like they need to withhold information because we do not have full research to back it.

I think a much more practical and useful sort of criteria is to say that the farmer is the one who is taking the risk. The farmer is the one who is best able to evaluate the applicability to his or her own operation. My responsibility as an information provider is to make the full range of information available. I would really love to see the Extension Service apply that sort of thinking to providing help to these local entrepreneurs.

Senator WELLSTONE. I wrote down when you were talking about reliable technical information. I noticed you made a distinction between presenting options as opposed to being prescriptive.

Mr. LUKENS. Exactly.

Senator WELLSTONE. Yes. I think I hear that loud and clear.

I was just thinking about ways in which SBA might more actively connect up with some of the entrepreneurs that you work with or some of what we are talking about. Someone was talking about the micro-loan program. I don't remember. Maybe I should just ask, Ms. Krome. I wondered whether you could elaborate on that.

I can tell you Minnesota has got very active community development corporations, and we have just really inspiring examples with this micro-loan program. Probably everybody here knows about it, but these are just essentially loans that banks would not give \$25,000 or less loans, with a special focus on "minorities" and women, but much less in rural America.

Ms. KROME. It was to that program that George Siemon with CROPP was alluding when he was saying that we need to have that program be much more flexible. I do not think he was criticizing the program insofar as it goes. I think it is a good program.

Senator WELLSTONE. No. That is right.

Ms. KROME. It is known for being a very creative, innovative program—

Senator WELLSTONE. That is right.

Ms. KROME. —also because it goes through private nonprofits and other groups who actually work on the ground and know what the needs are and can work creatively.

Senator WELLSTONE. Exactly.

MS. KROME. But I think that you are right, it needs to be used in rural areas far more, and it needs to be sensitive to the varying economic needs and the need for assistance in obtaining these. I think that has to be a very flexible program.

Senator WELLSTONE. Yes. The whole issue of access to financing I heard from any number of you all.

MS. KROME, this is kind of a loaded question for you because in a sense you live it. Jim said that. He said this is very important to me. Professionally I am involved it, personally I am involved in it.

By the way, I feel like I am too because our oldest son and his wife Tammy are trying to make it now in agriculture. Tammy was working with farmers and they kept saying you keep talking about it, why don't you do it? Much of politics is personal. I feel a very strong commitment to this trying to see them as young people trying to struggle to make it.

You do a lot of your work at the grassroots level, Margaret. Do you find that more farmers are talking about this, how they can reduce the input costs and how this is economically viable and not just sort of counter-culture? Has it moved more into the mainstream or not?

I tell you, it is very interesting, this National Academy study. It is going to be part of the future because we are not going to get the support that we need for agriculture, for family farmers, from consumers around the country unless we meet one of their essential demands which is they want the food that their children are eating to be safe for their kids. They are going to want to see the change. But what are you picking up?

MS. KROME. I guess I have to be candid in saying—

Senator WELLSTONE. Don't be candid. Just give me the good news.

[Laughter.]

Senator WELLSTONE. No. Be candid.

MS. KROME. It varies quite dramatically. In Wisconsin one of the terrific sustainable agriculture practices, which is intensive rotational grazing, has taken the State by storm, and it is virtually thanks to farmer-to-farmer information exchange. It is also thanks to a couple of good agricultural reporters in the State who have taken this issue and reported very responsibly and extensively on it. I am sorry to say it is not thanks to our extension system. It is not that we do not have a very good extension director in Wisconsin, because we do in fact. But it has not quite trickled down, and a lot of those agents have not been trained. That would help.

I think that lack manifests itself and a lot of the feedback we get at the local level in some of the other approaches. I think some of the cash grain farmers in Wisconsin resist this very strongly. They see it as threatening. They have already got the equipment. They think, oh, my gosh, what are they going to do to me. They are afraid and, frankly, a lot of farmers are right on the edge. I think all of us have said that today. Conventional or otherwise, a lot of farmers are on the edge and they are looking over their shoulders constantly. This worries them as opposed to entices them. I think that is very regrettable. It needn't be that way. It can be an exciting opportunity. It is for many, and I think that message really has not been conveyed as well I think it needs to.

Senator WELLSTONE. It is 10 after, but we will finish up with Ron.

Mr. KROESE. I just wanted to add that that points to the need for some of these broader programs like extension training and things like this because whether I like it or not, the Land Stewardship Project and the Wisconsin Rural Development Center are reaching a certain clientele. They do tend to be smaller producers. They often tend to be people with livestock. There is a huge issue in the Midwest. How do we reach people who do not have livestock? It is very difficult to make the transition to sustainable agriculture when you do not have the flexibility that livestock brings and crop rotation and alternatives to purchase chemicals for fertility, for example. That is why I think there needs to be more than ever an effort from the Government to come in and reach some of these people that we cannot reach. The larger farmers, the people that are more conventional have to be reached in some fashion, and the nonprofit sector just cannot do it by itself.

Senator WELLSTONE. Real quickly, Kathy.

Ms. OZER. One comment. The point in terms of access to credit deals with SBA. It also deals with Farmers Home where many farmers who have been making changes in practices are being denied credit on that very basis. There can just be one or two cases of that, and that information ripples through and there is the sense that we cannot take this risk because of the kind of pressure that we are under. I think that has permeated an awful lot of hesitancy, and when there is a crisis situation, that just exacerbates it.

Senator WELLSTONE. Well, this has just been an excellent hearing for me, and I really appreciate your taking the time to come here. It is all taken to heart, and there will be follow-up. Thank you very much.

[Whereupon, at 12:12 p.m., the Subcommittee was adjourned.]

ADDITIONAL MATERIAL SUBMITTED FOR THE RECORD

SENATOR PAUL WELLSTONE QUESTIONS TO G.W. BIRD (USDA/CSRS/SARE)

Question 1. What kind of small business opportunities are there associated with sustainable agriculture? Can you give examples of success?

Answer. Small business opportunities associated with sustainable agriculture can be placed in the following four categories: (1) service businesses, (2) supplies and equipment enterprises, (3) local value-added businesses, and (4) marketing enterprises. Development of economically viable small businesses designed to link agriculture with rural communities is an imperative of sustainable agriculture.

The nature of sustainable agriculture significantly increases the number of local opportunities for development of consulting businesses. These are designed to deal with pests, soil management, equipment maintenance, and overall enterprise design and management. Sustainable agriculture consultant businesses provide both transition and long-term services.

Since sustainable agriculture is site-specific and local in orientation, small businesses in the areas of supplies and equipment are a fundamental component of alternative agriculture. In many cases this includes both the manufacturing and marketing of the system inputs. Opportunities exist in the areas of specialized equipment compost, biorational pesticides, and beneficial natural enemies of pests.

A major key to the success of sustainable agriculture is through local enhancement of the value of plant and animal products. Local value-added businesses may be on-farm or in rural communities. Opportunities exist for both specialized and broad-scale activities. They can include both processing and packaging for local use or for distribution to other rural, suburban or urban areas.

The development of alternative markets is essential for the success of sustainable agricultural systems. Many current marketing opportunities are not designed to foster systems of sustainable agriculture. Small business opportunities in alternative marketing exist on a local, regional, national and international basis. They may also include the development of systems of Community Supported Agriculture or Agriculture Supported Communities.

To date, the Sustainable Agriculture Research and Education (SARE) Program has not formally accumulated data regarding the success of small businesses related to sustainable agriculture. The concepts have evolved from testimonials from farmers, ranchers and members of rural communities, and from informal observations. It would be possible, however, to identify appropriate case studies of success of small businesses related to sustainable agriculture.

Question 2. You mention the National Task Force on the Quality of Life? What is that and what has been their work product?

Answer. The Food, Agriculture, Conservation and Trade Act of 1990 mandates the Sustainable Agriculture Research and Education (SARE) Program to place emphasis on quality of life for farmers and ranchers, members of rural communities, and society as a whole. In partial fulfillment of this charge, a National Task Force on Sustainable Agriculture Quality of Life (SAQOL) was appointed and funded through SARE. The initial objectives of SAQOL are to:

- (1) Inform and sensitize the SARE Regional Administrative Councils and SARE Technical Committees on the nature of and importance of quality of life to agriculture.

- (2) Enable the SARE Regional Administrative Councils and SARE Technical Committees to recognize the potential quality of life impacts of project proposals. This is necessary to avoid detrimental impacts and encourage positive contributions of SARE projects to quality of life issues, and

- (3) Provide guidance regarding methodology for conducting studies to assess the quality of life impacts of sustainable agriculture implementation strategies.

Copies of the 1992 SAQOL Report entitled, Sustainable Agriculture and Quality of Life can be obtained by contacting Dr. John Ikerd, Chairperson, SARE Sustainable Agriculture Quality of Life National Task Force, Department of Agricultural Economics, 220 Mumford Hall, University of Missouri, Columbia, MO 65211.



August 6, 1993

Honorable Paul D. Wellstone
United States Senate
702 Hart Senate Office Building
Washington, DC 20510-2303

Dear Senator Wellstone:

Thank you for your interest in my testimony of July 14. I hope the following answers to your questions provide the background you need.

Your first question was as follows:

1. On page 4 of your testimony, you begin a section called "Why public/private partnerships," and you point to two of what I would call "market failures," or in other words, reasons for government to play a role.

A. First you list a set of pre-commercial development activities that entrepreneurs developing new uses frequently need assistance with in order to attract private investment: identifying viable market needs; designing equipment; obtaining regulatory clearance; and several others. Does AARC perform any of these tasks? Who does? Who could? What role could SBA play?

B. Then you mention the failure of the market on its own to promote social benefits, such as: use of degradable or renewable products; reduced air pollution; encouragement of value-added processing in rural areas. Does AARC affirmatively promote these kinds of benefits?

The pre-commercial development activities referred in to part A are the very essence of what the AARC Center does. The pre-commercialization stage is the most expensive aspect to bringing a new product to market--several sources cite it as being 100 times more expensive than the research stage and ten times more expensive than the development stage. Thus, AARC Center dollars are applied



Alternative

Agricultural

Research and

Commercialization

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to a project at a point when a company needs the greatest financial assistance. With AARC Center funding behind them, companies are able to complete the pre-commercial steps--conducting detailed market analyses, designing equipment, obtaining regulatory clearances, etc. With the AARC Center's involvement at such a critical point, the companies are able to demonstrate the viability of their products and, if necessary, attract other investors or negotiate better terms from traditional lending institutions. A few examples will help to illustrate how the AARC Center helps companies perform these tasks:

- Phenix Composite, Inc., a Minnesota firm, has developed a new building material based on recycled newspapers and soybean meal. The company has already invested \$1.5 million in the project. With an additional \$1 million of AARC funds, the company is building an initial production line, performing some advanced testing on the material, and developing a marketing plan.
- Aquinas Technologies, a Missouri firm, in cooperation with the National Corn Growers Association, has developed a non-toxic windshield washer solvent based on ethanol--as opposed to current methanol-based solvents that are poisonous. The organization has spent \$945,000 to get the project to its current state. With \$400,000 of AARC money, they are designing the prototype production line and developing a marketing strategy.
- Leahy-Wolf Company, an Illinois firm, has developed a release agent for use on concrete forms that is based on rapeseed oil. Current release agents are petroleum based and are a source of pollution. The company has spent \$77,000 of its own money to develop the product. They are using \$70,000 of AARC money to complete testing of the material and to develop their marketing plan.

In most cases, the firms find any technical expertise or advice they need from within the private sector. In the event that a company has difficulty finding some particular service or product, the AARC Center will assist them in identifying a good source. The point is, however, that with the aid of the AARC money, they are able to secure the goods or services they need to

complete commercialization. Obtaining money for such purposes from private sector lenders is extremely difficult.

The Small Business Administration (SBA), in my opinion, plays a complementary role to the AARC program. Through their Small Business Development Centers, the SBA provides assistance with market studies and identification of other resources for technical and engineering assistance--which can then be secured by a company using AARC funds. My understanding of some of their loan programs suggests that their focus is further back in the research and development stage, versus our focus on the pre-commercialization phase.

The last part of your first question concerns the AARC Center's encouragement of the social benefits that the marketplace does not always address. The environmental aspects of a project are a major criterion in our selection process. Following is the wording from two of the sections of our application, which demonstrates the extent to which we expect prospective clients to consider this area:

ENVIRONMENTAL IMPACTS: (Delineate positive and negative effects during production and processing phases; as well as for consumers and nation--including disposal.)

RESOURCE CONSERVATION EFFECTS: (Such as replacement of non-renewables and imports; crop diversification; water supply and quality; soil erosion; and use of existing, co-product or waste materials.)

Encouraging value-added processing in rural areas is at the heart of the AARC program. In general, the concentration of energy in plant matter is not sufficient enough to make it economical to transport it long distances for use as a manufacturing raw material--unlike the economics of transporting petroleum, where there is a very high concentration of energy in a given volume. Thus, we are virtually assured that any industrial application involving an agricultural raw material will be done close to the source of the raw material. We estimate that the 25 projects we are funding this year will result in more than 600 jobs being created in rural America within the next two to three years. If fully successful, the projects will eventually result in more than 10,000 new jobs in rural areas.

Honorable Paul D. Wellstone

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Your second question was as follows:

Why can't AARC give special priority to some of the social benefits that your testimony refers to?

- such as through favoring new uses that commercialize particularly clean or environmentally sound technologies?
- or through giving preference to smaller firms who need assistance more than larger ones?
- or by privileging small-scale, local, even cooperative processing that retains value-added in rural communities?

The first part is a follow-on to the previous discussion of the AARC Center's encouragement of some of the social benefits. As stated above, the environmental aspects are a major consideration of the program.

With respect to the AARC Center favoring smaller firms, I will say that some technologies require a critical mass to bring them to the marketplace and that critical mass can only be found in larger firms. One case in point is our funding of a project by Weyerhaeuser Paper Company. Weyerhaeuser is investigating the technology of converting waste straw from annual ryegrass into pulp for use in the manufacture of linerboard--the flat sheet of brown paper used to make corrugated board for shipping containers. The technology involves putting process steps together that are not new, but have not been attempted before in an integrated approach.

If successful, the net result of Weyerhaeuser's work will be two-fold: economic and environmental. The high cost of residual wood chips in the northwest--due to logging curtailment--has created significant economic burdens for operators of pulp and paper plants in the region. Developing straw as an acceptable substitute for wood chips could help save jobs at the plants. In addition, use of the straw provides a market for a commodity that is presently disposed of and creates environmental problems in the process. Weyerhaeuser has invested millions of dollars in this effort; AARC funding will be \$350,000.

In general, however, the AARC program does work with small firms--17 of the 25 funded projects this year are with entrepreneurial small firms. Following are some examples of the many social benefits coming from the work of these smaller firms:

- Aquinas Technologies, mentioned previously, has developed a unique arrangement with Goodwill Industries. Aquinas currently markets a traditional methanol-based windshield washer solvent. Goodwill provides the workforce for Aquinas' bottle filling operations. Switching to ethanol--a non-toxic, environmentally-friendly product--is expected to create a greater demand for Aquinas' filling operations and offer more employment opportunities for workers with disabilities.
- ARKENOL, Inc., a California firm, is developing technology to convert biomass to ethanol--an increasingly important additive to gasoline for octane boosting and control of emissions. In addition to the positive environmental aspects of this project, it could also have significant consequences for agricultural subsidy programs. Lands currently in the Conservation Reserve Program could be used to grow a variety of grasses specifically for use in biomass conversion; the farmer's would then make a profit from a commodity they sold, as opposed to receiving a subsidy for not producing anything on the land. ARKENOL is converting a mothballed ethanol plant in Texas and has committed \$7 million to the biomass conversion technology. The AARC Center is providing an additional \$1 million in funds.
- CCT Corporation of Goodyear, Arizona, is marketing a new pesticide. The dry, granular product is a blend of a well-known natural pest control--a bacterium called Bt--a carrier medium that is biodegradable, and a non-toxic substance that induces insects to feed on the granules. The product is activated by dew, rain, or irrigation water. Not only does the product reduce the amount of insecticide introduced into the environment, but it presents no health risks to handlers during

transportation or application. CCT has invested \$350,000 in the product, while AARC's investment will be \$170,000.

The final part of this question--retaining value-added in rural communities--refers back to the discussion presented above about the economics of using agricultural products as raw materials for manufacturing. I have cited below, however, some of the questions from our application, to illustrate the importance we place on the broader agricultural--and hence, rural--impacts of a project:

PROJECT LOCATION: (Where will the project be implemented and how will this impact the community?)

JOB CREATION: (Project the number and type of jobs that will be created.)

AGRICULTURAL MATERIAL UTILIZATION POTENTIAL (if successful nationally): Acres: Volume:

EXPECTED AGRICULTURAL PROGRAM IMPACTS (Will successful project impact federal crop subsidies or other agricultural assistance program costs?)

Your third question was as follows:

Can you explain the payback, or "reimbursement," provision of the AARC program for successful commercializations?

The payback provision is what makes the AARC program such a novel and innovative approach for government. With the smaller firms, we tend to establish an equity position with the company, with the provision that later on the AARC Center will sell back the stock. Our other approach is to arrange a multiple repayment scheme, with a deferred "interest." The repayment scheme is usually pegged to the percent of sales, so that if sales are initially slow, the firm is not strapped for cash in order to meet its obligation to AARC.

While we would hope that all of our investments are successful, we realize the possibility of failure. We only expect to be repaid if the project is successful. Also, there are a few smaller projects, where we have provided direct grants, without the requirement for repayment.

The taxpayer money that is reimbursed to the AARC Center goes into the Center's revolving fund and is used to finance future projects. It is the desire of the Board of Directors to eventually establish a fund of several million dollars.

I have enclosed a copy of our annual report, which may answer more of your questions concerning the AARC program. Should you have any further questions, please feel free to call at any time.

Sincerely,

A handwritten signature in cursive script that reads "Paul F. O'Connell".

PAUL F. O'CONNELL
Director

Enclosure



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